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RECOGNITION

The American Vocational Association at its business session in Los Angeles, December 19, 1927, passed the following resolution:

"WHEREAS, the Industrial-Arts Magazine has given generously of its space, through the past year, to the publicity and promotion of the Los Angeles meeting, BE IT RESOLVED, that we extend to this magazine our gratitude for its hearty cooperation."

It is with genuine pleasure that I transmit copy of this resolution to you—Z. M. Smith, Secretary, American Vocational Association.

The Industrial-Arts Magazine gladly did its share to help the A. V. A. spread the gospel of vocational education. Our slogan is "Service" and we are glad when we can render it.

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THE INDUSTRIAL ARTS MAGAZINE

Volume XVII MARCH, 1928 No. 3

INTELLIGENCE AND THE SHOP

Verne C. Fryklund, Department Industrial Education, State Teachers' College, Kearney, Nebraska

INTELLIGENCE is necessary in order to understand any form of instruction, whether it is oral or written. It is a factor that must be taken into consideration by teachers who prepare oral instructions as well as by those who prepare written instructions; by shop teachers as well as by academic teachers. The type of work or the method of teaching does not change the general effect of intelligence.

Many school problems, in discipline and in learning, have been attributed to instincts, typemindedness, and other psychological views that might have been accounted for by a clearer understanding of the problem of intelligence and individual differences. Low intelligence may be one of the factors leading to the desire of many children to leave school, especially near the end of the grammar-school period. A process of self-selection takes place. School life becomes annoying and the temptation to leave school is encouraged.

Success is satisfying and failure is disheartening. When success ceases to be a factor, school life becomes aggravating. It is annoying for the dull pupil to meet failure after failure. He soon withdraws from competition with those who are brighter and finds some consolation on the street or in industry. He leaves school and finds satisfaction in earning.

It should be of interest for the teacher to know that the importance of the theories of instincts and typemindedness is rather doubtful in the minds of modern educators.[1] That teaching is not even in part a problem of controlling instincts; and it is doubtful that a child may be a born mechanic or a born this or a born that. One of the most important factors underlying many of our school-leaving and school-teaching problems is intelligence.

Nature of Intelligence

Psychologists have not agreed on an accepted standard definition for intelligence. They seem to have agreed, however, that it is ability to learn by means of the higher intellectual processes, whatever that is; that it may be ability to do abstract thinking, to form analogies, to build up hypotheses, and to solve problems.[2] The following fundamental considerations of intelligence may help to explain certain facts in discussing the problem.

1. An individual is made up of many abilities[3] and traits; mental, physical, emotional, temperamental, sensory, motor, attitudes, habits, character, knowledge, information, ideas, ideals, etc.

2. All people possess in some degree all of the known human traits. Differences in people are in all respects primarily a matter of degree.[4]

3. People differ in the degree that they possess these traits. In nearly all traits the nature of these differences is such that for a group of people the traits follow a normal curve.[5]

4. People differ not only in the degree that they possess human traits, but the traits are organized differently in different people.

5. The nature of the organization of traits for a group of people is such that nearly all relations between all measured traits is positive. Between some traits this relationship is high and between others it is low. There is, however, no antagonism between traits.[6]

6. These traits are probably not born in normal individuals any more than are severed limbs. The potentialities for development of these traits are born in all normal individuals.[7]

7. Experience is an important factor in the development of these traits. Through experience they may be strengthened and through lack of experience they may be weakened.[8]

8. All individuals probably are born with a potential level or capacity to which all these abilities or traits may be developed.[9] In some individuals this level is low, in others it is high. This potential level is said to be the level of intelligence. It is not inborn. We have only the capacity to reach this level.

Let us consider these points carefully. An individual does not inherit one ability but a multiplicity of abilities. He inherits abilities to become anything for which he is trained in early home and school life. Early home and school life are very important factors in the ultimate development of the individual. He may become an equally good carpenter, mechanic, teacher, or whatnot. Or, he may become an equally poor carpenter, mechanic, or teacher. Ideals of success and failure are important in this development. The extent of achievement depends upon intelligence plus favorable experience and much work.[10]

Shop Manifestations

Individuals who possess a high potential level of intelligence achieve more under favorable conditions than those who possess a low level. The more intelligent possess ability to make adjustments to a greater number of different situations. This includes ability to carry on under unfavorable circumstances, ever to increase the ability to form analogies and solve problems. The less intelligent individuals are characterized by

[1]Watson, Behaviorism, pp. 84-86, 104, and others.
[2]Freeman, F. N., What is Intelligence? School Review, Vol. 33, April, 1925, pp. 253-263.
[3]Thorndike, Educational Psychology, Vol. III; pp. 366-387.
[4]Buckingham, B. R., Journal of Ed. Psychology, May, 1921; pp. 271-274.
[5]Thorndike's Third Volume, Chap. XIV.
[6]Thorndike's Third Volume, pp. 360-362.
[7]Colvin, S. S., Twenty-first Yearbook, pp. 17, 18.
[8]Gates, Psychology for Students of Education, p. 208.
[9]Goddard, H. H., Human Efficiency and Levels of Intelligence, pp. 1-8.
[10]Pyle, W. H., School and Society, Vol. 22, Sept., 1925, p. 408.

ability to react to only a few situations. They are narrow and restricted; greater and greater drill is necessary and the tendency to give up is more noticeable.[11] These are some manifestations that may be observed in all life situations. Shop teachers who have made sufficient observation have observed the variety of responses and methods of making them by pupils in adjusting to new problems. Manifestations are not the same in all individuals. However, a most significant outcome of all the multiplicity of manifestations is overcoming difficulties and readily making adequate adjustments.

Difficulties or problems are encountered in the shop as well as in academic activities. For example, a pupil in the shop is faced with a situation that requires a change of construction in order to overcome a change in design. It is quite probable that a less intelligent person with training is more certain to need the assistance of the instructor in overcoming this difficulty than one who is more intelligent and who has the same amount of training. The student who is continually needing assistance and is dependent upon his fellows and the teacher is most probably the less intelligent. Of course, we have exceptions in individuals who are lazy or physically unfit. The factor of laziness is probably a more serious factor than we are ready to admit.

Shop Intelligence

As shop teachers we are concerned with the ability of our students to get along well and to succeed in the shop. A general intelligence is required of individuals who succeed in the shop as well as in other pursuits of life. The degree of success is in proportion to the intelligence of the individual. It is true that a dull individual gets enjoyment and pleasure in the shop. That is, if he is not too carefully observed by the instructor and ideals leading to success are overlooked. The dull pupil is more easily satisfied, his work is probably crude and most commonplace. When attempting to plane, his success is mostly in causing a shaving to come forward; that is success to him, and success is satisfying. He has satisfied the ideals as he knows them in his world. But satisfaction in that sense is not real success. The pupil is getting along but he is really not achieving as we know its meaning. Any pupil, in order really to achieve in the shop, must possess a degree of general intelligence that will enable him to take advantage of his shop experience and thus develop a shop intelligence. As a rule, the pupil who can adjust himself well to academic experiences also adjusts himself to shop experiences and vice versa.

Intelligence and Environment

Since all individuals are born with a potential level or strength to which their abilities or traits may be developed, that fact suggests an important problem for the teacher. It means that experience, or environment, is an important factor in the development of these capacities to the highest level. The teacher cannot do much for the individual who does not possess at least a mediocre potential intellectual capacity. The best possible training that money can provide will not help the unfortunate individual who has inherited a poor intellectual mechanism or has developed limitations after birth. Idiots, imbeciles, and morons are included in this class. However, the individual who fortunately possesses a high potential level must be provided with proper training or his capacities will not be developed to their highest degree. The world is in great need of highly trained persons in all walks of life, and teachers of shopwork as well as teachers of academic subjects are much involved in this problem.

We are confronted with problems of the individual rather than problems of the group in our instructional process. Group instruction presents difficulties with each individual. Assuming that they are all like the middle fifty per cent, and must be treated accordingly, does not solve the individual problem. Since all people differ in the degree that they possess human traits, and since these traits are organized differently in different individuals, we are confronted with real differences in these individuals. Each teacher does not deal with one total of mediocre ability in classroom procedure, but he deals with a large number of separate abilities. The duty of the teacher is to assist in developing a shop intelligence in those individuals who possess a general intellectual capacity. It is not a problem of accumulating knowledge or facts, but of providing shop experiences and shop problems so that the individual may become competent to meet and overcome world situations of a similar nature. In order to meet and overcome new shop situations one must possess shop intelligence.

Just as there are individual differences, so are there differences in thoughts and in problems. Probably no world situation will ever be the same as any school situation so that accumulating facts and knowledge will be of little value unless accompanied by an ability to turn them into new solutions. This means that the individual must do abstract thinking, be able to make abstractions, form analogies and solve new problems. He must be intelligent and the kind of intelligence depends upon how he has been able to take advantage of and profit by past experience. In shopwork we are interested in developing a shop intelligence and we can do this by providing the experiences that will develop the capacities. There must be opportunity to do abstract thinking, form analogies, build hypotheses, and solve new problems.

Comprehension and Instruction

Difficulties in the use of well-prepared printed instructions may often be traced to the problem of intelligence. A large per cent of world success is dependent upon linguistic abilities. The ability to deal with symbols or to interpret facts from the printed page is a common requirement for those who desire to get along with their fellows and succeed in world activity.[12] Printed instructions[13] offer one of the best means for training the mechanic for future success. The learner must possess at least a fair general intelligence in order to interpret printed instructions. Likewise, the learner must possess at least a fair general intelligence in order to understand oral instructions. In fact, printed instructions may be even more desirable than oral instructions for the dull pupil. More opportunity for intensive study is possible with printed instructions, whereas oral instructions are momentary and are not easily scrutinized. The use of printed instructions should be encouraged; they are permanent and provide an excellent means of coping with individual differences.

Guidance Aspects

Since there probably is no typemindedness,[14] and since intelligence and favorable experience may be an important factor in education, we must approach the problem of guidance from a different point of view than that of exploration. It may be unwise to assume that an individual may be a born carpenter or a born teacher, and that he must explore in experiences until he finds himself. Each individual possesses potentialities for the development of all known human traits. Experience accompanied by the satisfaction of success is important in developing these traits. The *Law of Effect* operates in all situations in life. It is probably a question of building proper ideals leading to success rather than one of exploration. The boy who aspires to become an engineer must possess a high degree of general intelligence and ideals leading to success. Without these, he can never become a successful engineer.

The use of mental tests in guidance work should not be overlooked. Counselors and those interested in the guidance of pupils should take advantage of test results in order to verify personal observations.

All teachers should be interested in the testing program. Problem cases should have the same careful study and atten-

[11] Pintner, Intelligence Testing, pp. 55, 56.
[12] Perrin & Klein, Psychology, Chap. VI.
[13] Selvidge, Individual Instruction Sheets, Chap. I.
[14] Thorndike, Educational Psychology, Vol. III, Chap. XV.

tion of shop teachers that is had from academic teachers and administrators. Since so many dull children are sent to the shops, it may be wise for shop teachers to study the problem from the intelligence point of view. It may verify personal opinions and may sometimes brighten an almost hopeless teaching situation.

Conclusion

Intelligence, then, should be considered as one of the important factors in real achievement in the shop. Difficulties are as common in the shop as in academic classes and those who are not equipped at birth with at least a potential mediocre intelligence are seriously handicapped in their effort to do well in the shop. Those who can react to only a few situations and who cannot form analogies and solve problems, are problems for the teacher. It is unwise for us to first assume that our work of teaching is one of substituting acquired reactions for native reactions, or discovering typemindedness, or transfer of training. It would be well for us to know that the individuals with whom we must work are able to adjust themselves and profit by the shop environment with which they come in contact.

Individuals vary in abilities and the problems of the world vary in kind. Accumulation of facts and information, which may be learned by tedious memorizing, may be of little value in meeting new situations unless the individual can turn these facts into the solutions of new problems in his field of endeavor. Whatever that field of endeavor, the individual must develop a specific intelligence that has been built on at least a fair foundation of general intelligence. In the shop we are interested in developing a shop intelligence.

PSYCHOLOGY OF MECHANICAL DRAWING

C. A. Rosell, The Arsenal Technical School, Indianapolis, Indiana

MECHANICAL DRAWING is one of the simpler forms of drawing, being simpler due to its mechanical aspects and its analytical basis. Some phases which are the basis of representative drawing are not included or necessary in mechanical drawing. Representative drawing produces as accurately as possible the exact appearance of an object, while analytical drawing omits many details of surface construction. The necessary parts are emphasized at the expense of the characteristics omitted. At the same time the drawing may show more than one actually sees. Edges that are invisible to the eye are shown in an accepted form to distinguish them from the parts that can actually be seen by an observer.

Our problem, in this paper, is that of ascertaining what goes on in the mind of a child as he is grappling with the problems of mechanical drawing in an endeavor to master the principles thereof. Drawing is a mode of expression, consequently a language, so the problem is one of discovering the steps taken in learning what may be considered as a foreign language.

When drawing from a model, as a pupil often does, especially in his beginning work, he gathers a number of impressions or sensations of the object through his various senses. He may look at the object lying in a definite position and by supplying the missing information, complete the object in his mind through his ability to perceive the object as it actually is. In many cases, especially when the problem is simple or the object is familiar, perception through the sense of sight is all that is necessary to a comprehensive understanding of the object in its concrete form. If he is to make a drawing of a rectangular block and the block is lying before him in the position that it is to assume in the solution of his problem, he will not see all of the edges which he knows are present, but from past experience he can supply the missing edges in his true perception of the object.

Another pupil will say, "Give me the block; I want to see it." He wants to come in contact with the object through the sense of touch also. He will look at it just as he said he wished to but he turns it over and over in his hands until he feels that he has learned everything there is to learn about it, not merely through seeing the object, but because he has felt the shape of the object, and knows from tactual experience that the corners are square and the faces are rectangular. For some pupils this tactual experience is a great help, but it should not be practiced indefinitely to the detriment of developing the power of visualization.

Mechanical Drawing Requires Imagination

Three-view drawing or mechanical drawing is a new field to the individual. He has to accustom himself to refrain from representing things as he actually sees them. Even when he is told that the top view shows only what can be seen from above, he actually sees more as he looks at an object from above than he is allowed to represent. Thus, he must think of his eyes as being directly above each point as he looks at the object. In order to draw what he has seen he must learn that each edge perceived has its counterpart on his drawing through the construction of a line, and further, that each view can give information about two directions only. These and many other factors enter into the preliminary basis for further instructions. This requires a great deal of imagination on the part of the pupil even before he can begin on a problem. He will imagine himself as standing in various positions with reference to the object to be drawn, or if an object is available, he will actually assume the positions from which the object is to be viewed.

His mind now busies itself with thoughts of top, front, and end views of the object and the relative positions of each on the paper at his disposal. Some thought is given to the spacing of the problem so that the paper may be well balanced. Through imagination he arranges in his mind the appearance of the drawing as it will be in its finished form on his paper. Thus, he sees a problem that is well balanced in spacing with the views in their correct positions with reference to each other before he actually draws these lines. He has a visual image of the finished product whether that image is correct or not. If he obtains the wrong solution it is because the image is not correct.

Such mistakes as wrong relationship of views with respect to their relative positions, wrong position of the object with the corresponding relationships, and the wrong position of one view with reference to the other views are all due to images that are incorrectly formed during the process of abstraction. How do these incorrect images arise? Let us consider one of the cases and let it be a case where one view assumes an incorrect position with reference to the others. Two views are drawn correctly but the third is at right angles to what would be the correct position. The pupil has reasoned so that the size and shape are right, hence the only error is that of the position. He has forgotten that once the object is placed, one must think of it as lying in that one position only. His visual percept of the object has changed, and he sees the

object in a new position. Thus, he makes a very natural mistake which seems to him to be correct, for he does not realize what he has done in trying to help himself to a clearer understanding of the problem.

Rules vs. Visualization

Now it may be argued that if a pupil learns the rules of mechanical drawing, he will not make such mistakes as are mentioned above. This is partially true, but on the other hand, a course in mechanical drawing which developed no visualization on the part of the pupil, would be a very much inferior course to one which did. A drawing made by rule alone will not develop within the pupil the ability to visualize the structure of complicated objects, especially when the order is reversed and the problem is one of interpretation of a drawing from a blue print, or a completed drawing. If the pupil can see the object in its position and reason out the position of the views, he will develop a clearer understanding of the whole field of mechanical drawing. After the process of visualization has been developed, and the drawing becomes very complicated, strict adherence to the rules is the only solution.

The foregoing leads us into the problems of space relations. Although they are not as complicated as those which one would encounter in drawing of the representative type, they play a very important part in learning to understand mechanical drawing.

A certain feature lies, let us say, toward the back part of the object. The pupil sees this in a top view as being in the upper part of that view. Now, as he looks at the object from the side, it appears toward the right end of that view. The pupil perceives that a line runs upward in the top view while this same line in an end view runs from left to right. His ability to see the object in space and translate it into the three views on his two-dimensional surface, requires an interpretation of three-dimensioned space. The interpretation may be accomplished through a visual sensation or it may appear in the form of a muscular sensation. I have often observed boys in class, moving their hands in different directions, feeling in a muscular way how the drawing must appear on the paper.

If the drawing is to be made from a perspective or an isometric drawing of the object, the problem of space perception becomes more difficult, for the information gained from a representation of a three-dimensional object on one flat surface, must be translated into another method of giving the same information. The problem of seeing depth in perspective has been part of his experience all through life, but now he must make a critical study of what he sees and divide the problem into parts that he can use in each of the separate views to be drawn. Muscular sensations seem to be particularly useful here. The pupil seems to feel that this line runs in one direction, while another line runs at right angles to the first, etc. These sensations are then interpreted in the three-dimensional solution as worked out in mechanical drawing.

In order to execute a mechanical drawing in acceptable form, a certain degree of skill in handling the instruments is necessary. The pupil is made very conscious of his procedure while acquiring these skills, but after he has attained them he forgets all about the minute details that were once so necessary to his progress.

Learning by Imitation

Much can be gained in acquiring skill in mechanical drawing through imitation. Usually a drawing is made by the teacher in the presence of the pupil to demonstrate how a drawing should be executed. This often looks very simple but when the pupil tries it he finds that it is not so easy as it seemed. Instead of having control of his muscles in a masterful way, we may notice that muscles in almost any part of his body are being used. The nervous system is as yet unorganized for the particular process. These movements must gradually become organized into movements which are necessary to the particular skill.

In passing from the state of unskilled to skilled behavior in imitation, the child has a definite standard of achievement in mind, so he is constantly comparing his results with what he knows to be good execution. As long as his work is deficient in skill, as compared to his goal, he keeps on trying to reach this skill by repeated efforts. When he approximates skill in execution by repetition of trials, the movements which produce the satisfactory result tend to be repeated while the less productive ones do not become established in the nervous system. This consciousness of the goal to be reached is almost the only concern of the individual, therefore, we find it difficult for him to analyze his troubles. Consequently, rules or explanations for methods of handling the instruments are of the greatest value in helping the pupil to analyze his difficulties.

Acquiring Proper Muscular Control

The T square and triangles may be thought of as examples of the instruments used in studying what the pupil does in learning to use the instruments of mechanical drawing. They must be held firmly while a line is being drawn. The beginner is very conscious of this fact and we find him exerting undue pressure in his control of these instruments. As time goes on he loses this strained action of control and still later he forgets more or less about how the instruments must be handled and pays more attention to his problem. In other words, their use becomes a habit and consequently need not longer be analyzed.

In the use of the pencil we also find the sensory controls playing a very important part. Some lines must be made heavy while others must be light to give contrast between the object lines and other lines of less importance. When the pupil thinks of a line which is to be light in weight, his finger tension on the pencil is relaxed as he draws in contrast to a tighter grip on the pencil as he makes a heavy line. These sensations of pressure are part of his process of thought in making lines that have contrast in weight. Tactual controls are likewise developed in the use of all the instruments used in mechanical drawing.

Visual sensations and controls are also very obvious aids in developing skill in mechanical drawing. A line that appears light in some parts and heavy in others is an indication that pressure has not been uniform during the construction of that particular line and the pupil has a check on his execution that will help him to better it. Likewise a ragged line which has been made with a ruling pen is an indication of some error in its handling. This necessitates attention to the rules that the pupil is familiar with in guiding him in his inking. However, sooner or later he draws lines that are no longer ragged; he sees that the pen is held correctly without special thought of the same.

The foregoing mental processes seem to be at work in the mind of the pupil in acquiring an insight into the principles of mechanical drawing and in acquiring skill in execution. Although mechanical drawing is thought of as a very simple subject, it involves mental processes of several kinds, in addition to the development of coordination of motor controls in the actual execution of the drawing.

Opportunity

The actual fact is that in this day, opportunity not only knocks at your door but is playing an anvil chorus on every man's door and then lays for the owner around the corner with a club. The world is in sore need of men who can *do* things. Indeed, cases can easily be recalled by everyone where opportunity actually smashed in the door and collared her candidate and dragged him forth to success. These cases are exceptional, usually you have to meet opportunity half way. But the only place where you can get away from opportunity is to lie down and die. Opportunity does not trouble dead men, or dead ones who flatter themselves that they are alive. —*Elbert Hubbard.*

THE LATEST STYLE

A Short One-Act Play for Vocational Students
M. C. Richmond, Atlantic City Boys' Vocational School

CAST

(In order of appearance)

PAGE .....
MANAGER .....
MR. EARTHLY .....
CLERK .....

MODELS

THE CAPITALIST .....
THE PROFESSIONAL MAN .....
THE WORKER .....

COSTUMES

PAGE

Bell boy outfit.

MANAGER

Everyday attire. Small mustache.

MR. EARTHLY

Cutaway coat. Cane and derby.

THE CAPITALIST

Cutaway coat. Cane and high silk hat.

THE PROFESSIONAL MAN

Cutaway coat. Glasses; brief case.

THE WORKER

Unionalls.

CLERK

Everyday attire.

Title: THE LATEST STYLE

SCENE

Showroom of W. E. Humans and Co., whose motto is: "We People the Earth." To L, small raised platform for displaying models. To B and R, chairs. Door to R.

(Directions)

(When curtain rises, no one on stage. Then enter PAGE *R with easel in one hand and display cards in the other. He places easel to B and to R of models' platform and places cards in reverse on easel. He takes chair B C of stage.)*

PAGE

There, that's done! I wonder what time it is. *(Looks at watch.)* For a change, I'm early today. I think I'll have a little music. *(He takes harmonica from pocket and plays tune. Before he finishes, buzzer is heard.)* There she blows! An early show today. Must be a special customer in town. *(He pockets harmonica, goes to easel, turns cards about, stands to R of easel.) First card reads:*

MODELS
HUMANS & CO.
"WE PEOPLE THE EARTH"

(He goes to edge of models' platform and calls to models off L:) An early show today, fellows. Are you ready?

MODELS

All set. Let 'er rip.

(Commotion is heard outside R. Then enter Manager, Mr. Earthly, the buyer, Clerk with order book.)

MANAGER

(Just after coming through door.) You haven't been here since last year, Mr. Earthly. *(He motions him to chair B C.)* Here, have a seat.

MR. EARTHLY

(After taking seat.) You're right. We are so busy, I can't get away more than once a year.

MANAGER

(Rubbing his hands.) Well, this ought to mean a nice big order for us. What company did you say you represent, Mr. Earthly?

MR. EARTHLY

I didn't say, but I'm here in the interests of The General Peopling Company, and if I see what I want, I'm prepared to place a big order.

MANAGER

I'm sure there isn't anyone, anywhere, who has a more attractive line than we have. I'll show you our samples. *(He presses buzzer pushbutton on rear wall announcing beginning of show.)*

(Page removes first card and displays second card which announces: The Capitalist. *He then resumes former position. Soft music starts playing, model appears from L, mounts platform, makes two complete revolutions, stops half facing stage and audience. Music also stops.)*

MANAGER

This is our latest model of The Capitalist. You ought to be able to use quite a few of these. This is always a big seller. The hat and cane go with the outfit. How many dozen will you have?

(In meantime, after Manager has announced the model, clerk with order book and pencil ready, leans toward Mr. Earthly ready to take order. He does this for each new model.)

MR. EARTHLY

Nothing doing with The Capitalist. *(Clerk resumes former position registering disappointment.)* We're filled up with real ones and imitations. Why, I have heard it said that the railroads are run by the capitalists instead of the engineers. No, can't use any Capitalists at this time.

MANAGER

Take it away! *(Model steps off L.)* Bring in the next number.

(Page puts Capitalist sign in back of others and new sign announces: The Professional Man. *Business as before with Capitalist model.)*

MANAGER

The Professional Man! A very necessary article. How many gross shall we send you of these?

(Clerk is poised as before.)

MR. EARTHLY

Can't use any just now. Have too many as it is. They don't sell at all. Any number of these would sell better if they had a different label. Many of them are not really professional men. A mistake has been made in many instances.

(Clerk, as before.)

MANAGER

So, no Professional Men? You're very hard to sell today, Mr. Earthly. Let's have the next number.

(Model off left. Page as before. New sign announces: The Clerk. *Before new model has a chance to come on, Mr. Earthly says:)*

MR. EARTHLY

Never mind showing me this number. We have enough of these for years to come. We are overstocked. What we want

are workers. People to actually produce things. There is a big market for this product today.
We have plenty of people who will finance; plenty of people to direct, and any number of people to do the kid-glove variety of work, but there is a great scarcity of real workers. If you are making anything along these lines at present, I will be glad to place an order with you.

MANAGER

(*Musingly.*) Workers! We more or less discarded that model a number of years ago, but we may have a sample or two on hand. I'll see.
(*He goes to edge of models' platform and calls:*)
Have you a Worker sample on hand?

VOICE

(*Off stage L.*) Have one out to you in a jiffy.

MANAGER

(*Going back to Mr. Earthly.*) I hope this will please you. I would hate to lose your trade.

MR. EARTHLY

I also hope I can do business with you.
(*Model attired in unionalls appears on platform. As soon as Mr. Earthly sees this model he exclaims:*)
(*Rising.*) That's it. Workers, Workers! That's what we need today. How many can you make up for me on a rush order?

MANAGER

(*Calculating.*) Well, you see——

MR. EARTHLY

Can you make me up a thousand gross to begin with?

MANAGER

Well, I'll try. Yes, yes, I think I can. But what about those expensive models I showed you?

MR. EARTHLY

Nothing doing. I'm in a hurry. Here, let me sign your order book.
(*He grabs book from bewildered clerk, signs and prepares to make hurried exit R. Before doing so:*)
(*He shakes hands with the Manager.*) Good-by. Get these goods to me as quickly as possible.

MANAGER

(*In a daze.*) Certainly. Good-by.
(*Exit Mr. Earthly R.*)
(*Manager, Clerk and Page sink exhausted into chairs B C.*)

PAGE

(*After pause.*) Can you beat that! Orderin' that worn-out model!

MANAGER

If the man didn't represent such a reliable house, I'd think he was crazy. I thought the workingman was out of style.

CLERK

I had an intuition that it was coming back into style.

MANAGER

(*Rising.*) And your intuitions are pretty good. Here (*He digs into his pocket*) take this money, take a trip to Earth and see what is going on there. If it's Workers that they want, that's what we'll give them. We must never fail to give the latest style.

CURTAIN

ORGANIZING THE AUTO COURSE

L. F. Jennings, South High School, Minneapolis, Minnesota

THE most recent development of the gigantic automobile industry is the soft-cushioned leviathan of the highway, the modern motor bus. It typifies the many-sidedness of the present-day uses of the automobile, and the thousands of mechanical principles and scientific facts from which we must choose in organizing courses in auto work for specific groups.

Recognizing that it takes years to produce an efficient bus repairman, or any all-around automobile mechanic, it would seem difficult to make a short course in auto shopwork of much value. However, by carefully analyzing automobile repairwork, certain few jobs occur so frequently that they comprise the majority of trouble encountered by the car owner.

One of the specific groups for which the writer has had to outline a course in auto shopwork recently, is a class of twelfth-grade boys in a cosmopolitan high school.

The question arose as to what these boys needed to know. Did they need an auto repairman's course such as the writer had previously organized for garage mechanics in evening school? Decidedly, no! What they needed was a course in actual practice in caring for and maintaining the family car.

It was apparent that, due to the limited time of the course, it would be necessary to pick from the "repertoire" of the skilled mechanic those jobs that occurred most frequently in the garage shop.

Accordingly, the writer went to a garage in a suburb and examined the shop repair tickets for all jobs done between January and July first. He classified the jobs on 862 consecutive repair tickets calling for work on 37 makes of automobiles. The garage in question was selected because it was the only shop serving this particular suburban district, was near no specializing shop such as a tire or battery shop, and consequently got all of the repairwork from a considerable number of steady customers. The jobs were not seasonal, for the period covered included both winter and summer months. The number of jobs and makes of cars was large enough to get a fair sampling of the general run of repairing in this district.

As shown in Figure 1, the jobs fell naturally into three groups which made it convenient to teach the course in three

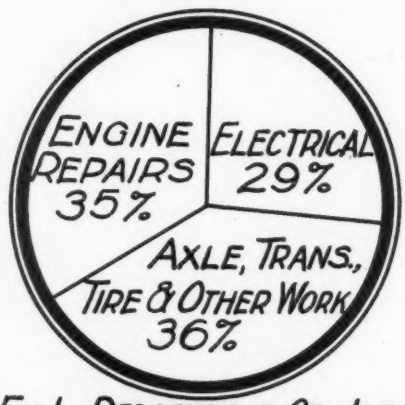


FIG. 1 PERCENTAGE OF JOBS IN THE THREE CLASSES

units. These three units are further divided into jobs in the order of the job frequency shown in Figures 2, 3, and 4.

It became evident that it was fifteen times as important to the car owner to know how to remove carbon from an

engine than to know how to time the ignition. It was evident that the generator got out of order much more often than the starting motor. It was more important to know how to

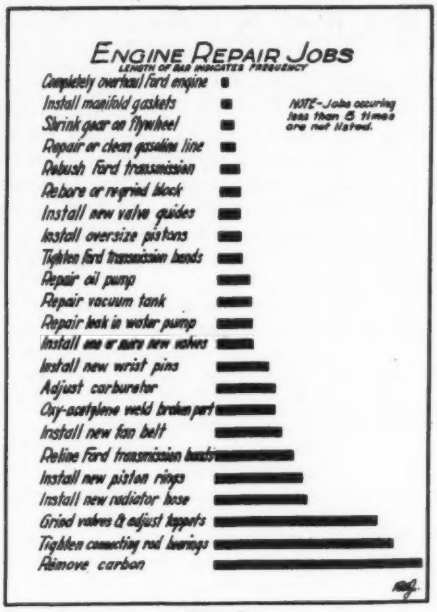

ENGINE REPAIR JOBS
LENGTH OF BAR INDICATES FREQUENCY
Completely overhaul Ford engine
Install manifold gaskets
Shrink gear on flywheel
Repair or clean gasoline line
Rebush Ford transmission
Rebore or regrind block
Install new valve guides
Install oversize pistons
Tighten Ford transmission bands
Repair oil pump
Repair vacuum tank
Repair leak in water pump
Install one or more new valves
Install new wrist pins
Adjust carburetor
Oxy-acetylene weld broken part
Install new fan belt
Reline Ford transmission bands
Install new piston rings
Install new radiator hose
Grind valves & adjust tappets
Tighten connecting rod bearings
Remove carbon
NOTE - Jobs occuring less than 5 times are not listed.

FIG. 2

take up a worn connecting-rod bearing than to adjust the carburetor.

By taking certain of the commonest jobs in each group it was possible to build a job outline for a course. Shop knowledge outlines were prepared for each job. The jobs and shop knowledge were taught by demonstration, lectures, blackboard sketches, and textbook assignments. Notebooks were kept by all. The ratio of lecture-demonstration time to shop time was two to three. Each boy was required to do all of the jobs selected and do them alone.

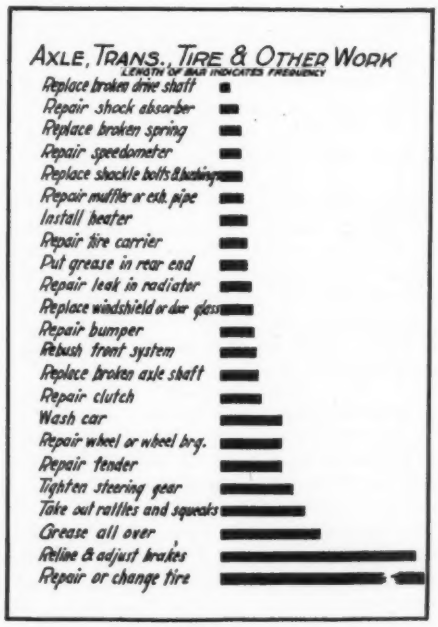


FIG. 3

The school equipment for this course consisted of several old engines, generators, starting motors, axles, transmissions, etc., an assortment of garage tools, and one complete automobile. Outside repairwork was taken in whenever the job could be made to fit into the course.

Although this analysis was and is being used in selecting jobs in the twelfth grade, it must be understood that only a few of the most frequent jobs in each group are attempted in this short auto course. Six jobs from each group, eighteen in all, are given special emphasis. Many of the jobs not done by the students are covered in demonstrations by the instructor.

Organizing a course reminds the writer of assembling motor busses in a certain factory. In this plant busses and trucks of different sizes and for different purposes were produced. They were largely assembled from standard units. From plants located in various parts of this and foreign coun-

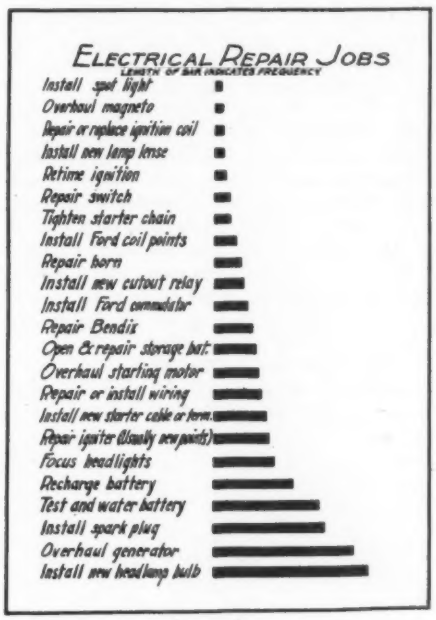


FIG. 4

tries, came clutches, engines, frames, axles, air brakes, generators, etc.

When certain carefully selected parts were assembled, a bus to meet a certain need was produced. Likewise, when certain carefully selected skills and knowledge are taught in an auto shop a definite result is obtained.

When training efficient car owners, the skills and knowledge must be as carefully selected as when turning out auto mechanics or automotive electricians. A carefully organized course will produce better graduates and better citizens.

VOCATIONAL VS. CULTURAL EDUCATION

When we think of education as a training for the individual in order to maintain the social balance and to serve society, we naturally get a different slant on education from the cultural viewpoint which seeks to elevate the individual for personal ends.

This may be illustrated so that it will be readily understood by the ladies. *Home Economics* is teaching a girl to make cheese soufflé in a chafing dish. *Homemaking* is teaching a woman to hold a baby under one arm and chop corned-beef hash with the other and at the same time take intelligent care of both baby and hash.

Vocational Education aims to meet the practical necessities of life. It enables an individual to pull his weight in the boat.—*J. I. Sowers.*

DIVERSIFIED SHOPWORK IN ACADEMIC SCHOOLS

Virgil H. Best, Garfield High School, Los Angeles, California

AT JAMES A. GARFIELD High School in Los Angeles we are doing work with seventh- and eighth-grade boys in the shop classes, which is proving very successful.

The Garfield school is a six-year high school and has completed its first year of existence.

Type of Work

The work of 7B, 7A, 8B, and 8A grades is of a varied nature, consisting of repairing sockets, electric irons, bicycles. making sugar scoops, bird cages, small electrical devices, and the like. Because of its appeal to most boys, a large part of the time is spent making small electrical devices. Two of these will be here described more in detail.

Moving Things

Anything the boy can make that has special utility or chat has motion appeals especially to him. A simple semaphore traffic signal answers the latter purpose in addition to arousing in the boy a curiosity as to why it works. The boy is not told what his final product is to be nor even that there is more to it than given on the first job sheet. Each of the three first sheets is a separate, complete job in itself, which complies with a very necessary point; that his interest does not have to be maintained on a given job for a very great length of time.

The Work Sheets—The Semaphore

Mimeographed work sheets of the kind here shown are used and prove to be of great assistance, especially the picture or diagram part.

The first sheet gives the specifications and methods of making a tube of fish paper on which to wind a coil. As may be seen from the sheet itself, this job is very elementary, but not too much so, because the boy perhaps is taking directions from print and picture for the first time in his life. In our experience many have to try a second time to make a satisfactory tube.

The second sheet gives the methods used in winding the coil, and the third directs the making of two spring terminals, to be used as connectors. The fourth sheet explains how to make the final parts and assemble all into the complete semaphore. When connected to several dry cells or a low-voltage transformer, the signal arm rises from the lower nearly vertical position to a horizontal position in a very realistic fashion which appeals to the boy.

The Alternating-Current Buzzer

Another original device which is quite a favorite is a small alternating-current buzzer which is proving an excellent project, simple, yet requiring care in its construction and possessing both utility and motion. The work sheet supplies practically all the information necessary, but is supplemented by lecture work, and suggestions and demonstrations as the job progresses.

Other Jobs

Many other small jobs are done as the need arises, each boy providing some of his own projects. The instructor here must be very careful not to let a boy undertake too difficult a job and thereby cause disappointment. All is bound to go well if the boy is kept busy and interested.

Need for Early Shop Exposure

In many high schools it is found necessary to have one or another shop course prerequisite to taking some other course. In many cases this situation makes administration difficult, not to mention the problem of dealing with disgruntled boys who had their hearts set on some particular work.

There are three reasons why the above condition is made necessary: First, the inability of many boys to use tools at all satisfactorily; second, their ignorance of the content of shopwork, of shop methods and procedure; and third, the need of some system of eliminating certain students entirely from the more advanced work, both for their own good and for that of their fellows and the equipment.

It is not to be assumed that this condition is all an evil to be eliminated, nor that we claim especial credit for eliminating that part which is evil. Any system of early shop experience would do this in large measure. Our special contribution is the method used to direct the boy to the proper shop in the ninth grade and in the material of the elementary course. A home-mechanics course may be of twofold value. It serves as a testing or finding course for future courses and also may train for direct usefulness, especially in the home.

"Home Mechanics" for the Home

It is common knowledge that numbers of students drop out of school at every point along the educational highway, and because of this fact, we should make great effort to give these people the very cream of education up to their capacity, not only in shopwork but in all other schoolwork as well. This early training, in the use of the hands and hand tools may prove of inestimable value to these people, especially in the home. There are many little jobs requiring a negligible amount of time, if attempted with a little confidence and a small amount of mechanical skill. Then there are those boys who will drop out early who may be guided vocationally, through their acquaintance with shopwork. How seldom do we know what factors are going to determine one's future career. The more varied a person's experiences, the more likely is he to move wisely. To advance this aim, the work must be of a varied nature.

Shop Arrangement

Our shop for this work is a little unusual in that it is suitable for both wood and metal work and also has a section of tablet armchairs for recitation and lecture purposes. It is not necessary for the students to sit or lean on workbenches, with the accompanying discipline problems, while receiving directions. The chairs are so placed that use is made of them which would never be done if located in a separate lecture room.

The other equipment in the room consists of several ordinary sloyd benches slightly altered so as to be suitable for light metal work as well as woodwork. Other benches with metal-working vises, anvils, and gas furnaces are provided. The room is also supplied with an 8-volt direct current, and a 110-volt alternating current which is reduced, with transformers, where necessary. It also has its own tool and stockroom with a boy from each class in charge.

Orientation

In order to place the boy in the shop class best suited to his needs, the shop teachers of the seventh and eighth grades ask each of their students near the end of the term, as to future shop intentions. With the choice expressed by the boy, the teacher files his own recommendation. Then when the boy reaches the ninth grade, the summary opinion of all these statements is made by the head of the mechanical-arts department and is given to the boy's advisor to assist in making the student's program.

Through this plan we hope to make smoother-running high-school classes. When the boy reaches the ninth grade

we expect to find a greater appreciation of shopwork, a better idea of what subject he should follow, and an increased manual dexterity.

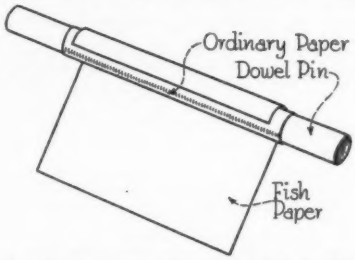
Sample Work Sheets

Work Sheet No. 1

Electric Coil Form

Object: To make a neat fish-paper tube on which to wind an electric coil.

Procedure: Cut a piece of fish paper 2½ by 3 in. and wrap around a ⅜-in. rod or dowel pin to make a 2½-in. long tube. Have



a thickness of ordinary paper next to the rod so the glue cannot stick the fish paper to the rod. Wrap string around the tube to hold it in place while the glue dries. Be sure the fish paper fits snugly around the rod.

Questions

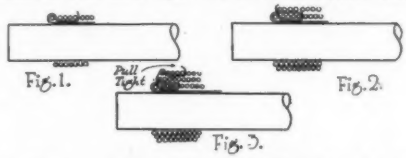
1. How long before you can remove the string and rod?
2. Why is fish paper used to make the tube?
3. Would a tube of brass or copper be as good or better than fish paper?
4. Why?

Work Sheet No. 2

Electric Coil

Object: To wind an electric coil.

Procedure: Procure a piece of No. 22 S.C.E. copper wire 28 ft. long and wind a 2-in. three-layer coil on the fish-paper tube, starting



as shown in Figure 1. To do this you will need a piece of cotton binding tape ¼ by 4 in. If you cannot get tape of the correct width, you can cut it from a wider piece. After the tape is looped over the first turn and two or three turns are on top of the tape, the first turn should be pulled as tight as possible and then the tape pulled so as to bring the first turn of wire up tight against the second. All wire should be wrapped tightly around the tube and against the previous turn. When you get ready to start back with the second and third layers, the end turn will have to be bound as shown in Figure 1 or Figure 2 to keep it from falling off.

When within six or eight turns of the end, prepare for binding tape as in Figure 3, so the windings will hold it down, and when within about four turns of the end, double the tape back leaving a hoop through which the last turn is threaded after three turns have been wound on the double tape. After the last turn is threaded through the loop, the end of the tape now protruding from the side of the coil is pulled until the loop is drawn together, thus fastening the end turn.

In winding coils of larger size, it is necessary to bind the end turns in two or more places to hold the coil firmly.

Questions

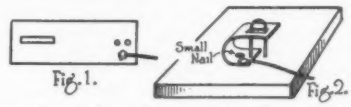
1. How could you determine the length of wire necessary to wind a coil?
2. How long would a wire one half as large have to be to wind a coil of the same dimensions?
3. What will happen if the winding of the first layer is not tight or close together?
4. Should you expect the third layer to be as smooth as the first?

Work Sheet No. 3

Spring Terminal

Object: To make a spring terminal to be used as a binding post.

Procedure: Take two pieces of thin spring metal ½ by 1½ in. and cut a slot in each measuring ⅛ by ⅜ in. with a small cold chisel. The slot is to be located ⅛ in. from one end of each piece. The slot may be made by driving a cold chisel through the metal into the end of a block of wood and filing off the burr, or it may be cut with a cold chisel on an anvil in the usual manner. Punch two small holes through the other end, ⅛ in. and ¼ in. from the end. Figure 1 shows the strip before bending and Figure 2 shows the terminal bent and fastened to a board. A small staple placed as



shown in Figure 2 completes the terminal. The wire of the device to which the terminal is to be fastened is soldered permanently to the terminal.

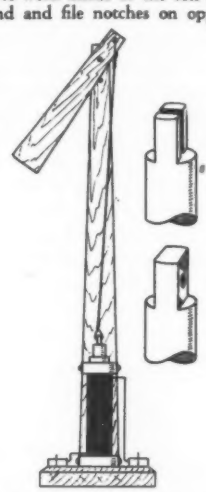
Work Sheet No. 4

Semaphore Traffic Signal

Object: To make a semaphore traffic signal.

Procedure: Make a base of wood 3 by 3 in., and ⅜ to ¾ in. thick, depending on what material is available. Bevel the top edges, and sandpaper smooth. Next make a post 10 in. high which is ¾ in. square at the bottom, and tapers to a ½-in. square at the top. Fasten this with glue and one or two nails to the base. Now fasten the coil you already have to the bottom of the post with two straps made of pieces of tin ¼ in. wide. Be sure the straps are tight and the tube is resting on the base. Next fasten the two terminals you have made to the base and solder the wires of your coil to them. Then make the signal arm of wood ¾ in. wide, 4 in. long and tapered from ¼ in. at one end to ½ in. at the other. Bore a small hole through the arm about ⅛ in. from the thinnest end. One-half in. from this hole bore another hole. Put a shingle nail through this hole and nail to the top of the post.

Make a plunger to work inside of the coil by taking a rod 1½ in. long and ¼ in. round and file notches on opposite sides at one end



⅛ in. deep and ¼ in. long. Now drill a small hole through the flat portion. Pass a string or a piece of thin wire through the hole and connect the other end to the signal arm. This suspension should be of such a length that the plunger is near the top of the coil when the arm is in the lower position.

It may be necessary to change the weight of the signal arm by adding iron or lead on the end, or by planing from the sides to lighten it. It should be just heavy enough to drop and lift the iron plunger when there is no current in the coil.

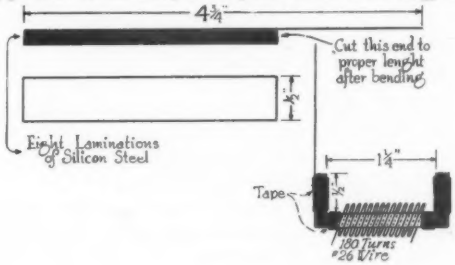
Now paint the wood parts and the signal is complete.

Work Sheet No. 5

Alternating-Current Buzzer

Object: To make and wind a simple alternating-current buzzer.

Procedure: Carefully cut eight strips of transformer iron or stove-pipe iron ½ in. wide, seven pieces about 3 in. long, and one



piece for the outside, 4¾ in. or longer. Place all eight pieces together with the long piece on the outside.

With all pieces even at one end, place this end in a vise with just ½ in. of the bundle in the vise, being careful to have it vertical with the jaws. Hammer over to a right angle. Remove from the vise and in a similar manner make another bend just 1¼ in. from the inside corner of the part which has just been bent.

Now remove the outside lamination and cut the uneven ends of the remaining pieces to ½ in. to match the other end. Now separate the laminations being careful not to mix them up or reverse ends and bend the inside two or three out a little beyond a right angle, and the outside two or three laminations in a little past the right angle. Now when all are forced together again the ends will fit tightly.

Next wrap friction tape around the assembled parts, using four short pieces of tape. It will be necessary to cut ¼ in. from the side of ordinary friction tape for the ends and from one piece, for the middle part of the buzzer. The edges of the tap should be made just to meet and be wrapped straight around instead of progressively as is usually done.

Next wind 180 turns of number 26 S.C.E. wire on the iron as shown in diagram, using the method of starting, binding end turns, and finishing as given in the work sheet on winding electric coils. The buzzer should then be mounted on a suitable base and provided with terminals.

GRADING IN DRAWING COURSES

Towne R. Abercrombie, Ironwood, Michigan

IT IS NOT the intention of this article to present a definite standard for universal use, relative to grading students in drawing courses. The problem of establishing one universal method for grading the pupil, or his work, will require years of experimentation, and the standard presented would necessarily involve so many details that it is very doubtful if it will ever become established. In all probability, a standard for a community where the students would be able to secure employment as draftsmen after leaving school, would be different than the standard for the student who takes the subject simply as one phase of the usual vocational courses offered him in our schools. In this article, it is hoped that some help may be given in the grading of the average pupil.

All phases of drawing have been termed "the graphic language." In this respect it is universal, and we find all the different variations which exist in spoken or written English. We can easily detect the "slangy," and we can find the correct rhetorical expressions, but unfortunately the latter is in the minority. As in our English language, our graphic language is misused to a great extent. The intelligent foreigner puts forth his best efforts to speak correct English, in order that he may be clearly understood; others continue to use their language, with a mixture of English, with the result that the language which they use, is scarcely recognizable. The same condition prevails in our drawing courses. Some students put forth their best efforts to make their drawings, that is to say, their graphic language, correct in every detail, so that it can be easily understood. Others mix their own ideas with that which is correct, and the result is a drawing which is practically impossible to visualize.

In order to intelligently grade a specific problem, or pupil, in any subject, it is essential that the subject first be properly taught. When a student begins the study of English, Latin, French, or some other language, the characters composing it must be mastered before he can understand what he is doing. He cannot assimilate Latin from the study of one chapter; neither can he fully understand the graphic language after making one drawing. He has, however, grasped the meaning of some of the characters used, such as lines, curves, angles, and the like. These he must memorize and store away for reference for each succeeding drawing. As the various characters are taught in the English language they are formed into words; words into sentences; sentences into paragraphs, and these again into completed chapters. Drawing should be taught in the same manner, in order to assure a thorough working knowledge of the subject. The lines, arcs, angles, etc., form the individual characters; these characters are assembled into views; the various views are related and assembled to form the different parts, and the parts are put together to form the completed assembly.

The methods used in awarding a so-called grade for completed drawings are, as previously stated, varied in practically every locality. A statement from a hundred different teachers relative to their basis for grading, would very likely bring forth a hundred different replies, each one stressing some one particular point to the exclusion of others. The following is a list of several points upon which grades are based:

1. Selection, relation, and arrangement of views.
2. Quality of lines used throughout, in accordance with an alphabet of lines.
3. Dimensioning, including notes and specifications.
4. Letters, figures, fractions, arrow points, etc.
5. Accuracy.
6. Speed.
7. Neatness.
8. Aptitude of the student.
9. Effort or application.
10. Final results.

In this article it is not intended to stress one point more than others. The question about which of the foregoing points is the most important has been argued pro and con for a good many years, and will continue to be argued for years to come. It is not expected that all will agree with the methods stated in this article, but the writer welcomes criticism. We are all working toward one end and the interchange of ideas will surely help to establish a more uniform system.

The writer bases his grades on the following points:

1. Selection, relation, and arrangement of views.
2. Quality of lines.
3. Dimensioning.
4. Letters, figures, etc.
5. Accuracy.
6. Effort, or application.

The first question, or criticism, will probably be, "What do you allow for neatness?" The answer would be that we contend that if points 1, 2, 3, 4, 5, and 6 were properly cared for, the drawing would necessarily be neat, or it would have been redrawn. In teaching the subject, be sure to make the characters composing it perfectly clear, for clear expression is the fundamental requirement. The elementary principles should be taught first, and no deviation should be allowed from the purely correct rhetorical expressions. Do not allow the "slangy" phrases to become evident in any of the drawings.

One of the fundamental principles which should be incorporated early in the course, is the proper relation of the views. This being done, there should be no question in the minds of the students as to the proper selection, relation and arrangement of views so as to give proper balance to the sheet. In establishing a grading system this should receive a great deal of consideration. The second step is the quality of the line used. This is certainly of great importance, and no student should be allowed to advance until he has mastered the alphabet of lines, for in drawing, as in English, the lines are the alphabet and must be given consideration before sentences can be formed. Here, as in many other instances, there will

be a decided difference of opinion, for no definite standard has been established as to the exact weight of a line. The proper size will vary to a great extent on different types of drawings. We can, however, maintain a certain proportion that will be fairly uniform wherever we may go.

After the principles of views and lines have been mastered, the next important step, and equally as important as any of the others, is the dimensioning. The lines and views define the shape of the object under construction, the dimensions tell its size. In grading a drawing, therefore, we should give an equal amount of importance to the dimensioning. Under this heading would come the lines proper, the spacing from the views, their relation to the views, etc.

Lettering, including fractions, figures, arrow points, etc., is also of great importance on a drawing. A properly executed drawing may be ruined by faulty lettering, or misplaced figures. The fifth step in our grading system may be said to cover the entire drawing procedure, in fact, it is rather a general summary of the entire appearance and usefulness of the sheet.

The last step in our grading method is one upon which there appears to be a wide difference of opinion. Shall we allow any credit for the effort expended in the completion of a sheet? If so, to what extent? Here we have one pupil who with little or no effort turns in a drawing which we consider as a 95-per-cent product. At the next bench is a pupil who must exert every effort in order to present a drawing which will pass the inspection of the instructor. Faithful, persistent, yet not capable of turning out anything but an average piece of work. How much credit shall we allow him for the effort which he has expended? It is the impression of the writer that we should give him a very liberal amount. I do not infer that the same grade should be given him as to the individual who can turn out exceptionally good work, but I do maintain that sufficient credit should be allowed to pass him in a satisfactory way. In this instance, if we used the point of natural aptitude, the chances are that the second individual would be a failure. It is to be expected that there will be an occasional pupil who will fail. Ofttimes this is the direct fault of the pupil through inattention to detail, carelessness, or failure to apply himself to the work at hand. On the other hand, a careful check should be made to see if the instructor is in any way at fault for the failure. Pupils will fail for the above reasons; they will also fail if the teacher does not clearly define the minimum essentials in the course, and then provide adequate drill in the same. It is also true that some instructors expect the same quality of work from the ninth grade as from the twelfth. Other reasons may be the failure of the school authorities to provide special sections, or special courses for pupils of low ability or inadequate preliminary training; the failure of the school to seek to discover the real cause, or causes, of the failure of the individual pupil; or the practice of urging teachers to distribute their marks according to the normal frequency curve. There are probably numerous other reasons which we could specify for the failure, both from the teacher and pupil standpoint. At all events, teachers should attempt to present subject matter in such a way, and with such adequate drill, that the reflection of poor workmanship cannot reflect on them. Certainly teachers cannot honestly deduct percentages from the pupils' grade to cover omissions in teaching, yet this is sometimes done in an effort to cover teaching defects.

If teachers of drawing would spend enough time, and devote enough energy, at the beginning of their courses in requiring students to form correct habits, the problem of awarding a grade would not be difficult.

The question might arise as to the method of applying this system of grading; whether any objective tests are applied, and if each of the six points mentioned in grading are weighted, or if an equal percentage is given for each point. The present tendency is to get away from the personal and subjective method of grading, and use the objective or standardized testing.

In this respect, let me say that we have a definite aim, or objective for our course consisting of the following points:

1. To learn to read a drawing.
2. To learn to make drawings of shop projects.
3. To learn to read and write the graphical language of the industries.
4. To gain an insight into the drafting profession.
5. To train in habits of neatness, accuracy, and observation.

The grading of our drawing plates comes as a natural sequence to the objectives. In order to learn how to make a drawing of a shop project, or to learn how to read and write the language of the industries, will require a definite understanding of the selection, arrangement, and balance of the views. To gain an insight into the drafting profession, it is imperative that the proper quality of lines, correct type of lettering and dimensioning, and the maximum of accuracy be thoroughly drilled into the pupils. To train in habits of neatness, accuracy, and observation, we must necessarily give due credit to the points of accuracy and effort, or application. By comparing the aims or objectives of our courses with the points which we employ in our grading, it will be evident that we are applying the objective tests in our grading system.

Relative to the scale of points given each item in the grading scale, we consider each item in its relative importance. To be a successful shop drawing, the views must be properly selected, balanced, and arranged, as well as being properly dimensioned. The lines, or views, tell the shape; the figured dimensions tell its size. Each drawing should be made with the thought in mind that some mechanic is to work from it, that it is to aid him in his work, and, therefore, should be made to function as fully as possible. Considering these points, we would give Number 1 a total of 20 per cent, and Number 3 an equal rating. The quality of the lines used, Number 2, and the proper lettering, Number 4, including figures and fractions, are estimated as being of equal importance and are given a rating of 15 per cent each. For points Numbers 5 and 6, we also allow 15 per cent of the total value of the completed plate, as we feel that these two points are equally as important as the others and, therefore, should have as high a rating. To summarize, the weight of points appears as follows:

Number 1,	20	per cent
Number 2,	15	per cent
Number 3,	20	per cent
Number 4,	15	per cent
Number 5,	15	per cent
Number 6,	15	per cent
Total.	100	per cent

CHOOSING A VOCATION

It is our business, as directors of public education, to provide the information and to afford the education that will enable pupils to make an intelligent choice of the vocation which they wish to pursue; it is our business to advise with parents and pupils with reference to such a choice, and to help them to make a wise decision based upon ability, inclination, and opportunity; it is our business to help them prepare for entrance upon the vocations of their choice. It is the big business of a community, large or small, to prepare its young people for life; and an important part of life is the ability to make a living; for a life is not likely to be well lived unless one is engaged in a congenial occupation, and in one in which he is reasonably successful.—*Randall J. Condon, Cincinnati, Ohio.*

INDUSTRIAL-ARTS MAGAZINE

EDITORS

E. J. Lake *S. J. Vaughn* *J. J. Metz*

ESSENCE OF TEACHING

Everyone affects, to a greater or lesser degree, the lives of those with whom he associates. This is true regardless of age or position. It is of the utmost importance in schools where the guidance and educational processes take place. Industrial-arts instructors associate with youngsters who are passing through a formative period of development, thereby making this association of considerably more significance than that of teachers in higher educational institutions.

How little some instructors think of these important facts. Many are content to keep discipline, turn out a quantity of products, perhaps good workmen, and consider their job well done. It is not enough to develop the exterior or visible side of our teaching. Leaders in all walks of life, including school administrators, are recognizing the need of more adequate ethical character development in our scheme of education. It behooves each of us, therefore, to devise ways and means of creating situations and guiding the activities of our students so that this essence of education plays a significant rôle.

It is possible for the shop instructor to produce excellent workmanship and to produce craftsmen well drilled in the mechanical manipulation of machinery and tools without giving them the most important attribute of a good citizen or a good mechanic. Of course, there also are shop instructors who know how to train boys who are worthy of future citizenship and at the same time worthy of being members of a skilled craft.

To which class of teachers do you belong?

PROFESSIONAL SPIRIT

The professional spirit in many fields has advanced for the benefit of society and the workers in those professions. Doctors, lawyers, business men, and engineers have each banded together for their mutual advantage and the advancement of their professions.

Teachers as a whole have not yet awakened to the importance of their organizations for raising the standards of their profession. Wherever added preparation for entrance into the teaching profession has been required, and wherever salary schedules have been revised, it was due chiefly to the work of state departments of education, or of school executives through the national educational associations. The professional spirit for advancement of teaching has not been manifested whole-heartedly or otherwise by the classroom teacher. Too often teachers have looked upon added preparation for those in service as a burden and have worked against the advancement of the profession.

Until the great body of teachers use all the influence at their command to raise the standards of teaching and the teaching personnel as other professional people have done, teaching will continue with the slow, steady growth it has had, but will never attain the high standard it rightfully deserves.

Our state and national association, made up chiefly of teachers, and controlled for the most part by school executives, are in a position to strongly influence the passage of laws affecting this profession, spreading propaganda for real advancement, strengthening the quality of teacher-training institutions, lengthening the preparatory period for teaching, and finally raising the salary schedules as a national proposition.

If standards are raised by those who control the educational associations and there is a whole-hearted cooperation of the teachers as a group, these executives will be justified in materially increasing teachers' salaries as well as improving teaching conditions. They will have the approval of the public which pays the bill, and the public will pay for services rendered if it is made aware of those services.

It is the duty of all interested in education, whether in a teaching or executive capacity, to consider the profession greater than their personal desires, and to work for a professional spirit which will bear fruit through the combined efforts of all.

TEMPUS FUGIT

Here we are with February almost over. It seems hardly possible that school has been in session for 6 months. Just a few months more, and the school year 1927-28 will have slipped into oblivion.

Last June when we were so busily engaged in making out our inventory, do you remember how faithfully we promised ourselves that next year, said inventory would be practically completed by the time the final examinations came around? Do you remember how we had planned to start a perpetual inventory for all equipment and supplies on the first school day, so that taking inventory would simply mean a few minutes spent in copying totals?

Then September came, and with it, the turmoil of opening classes, and all the extra work incident to getting started. In the hustle and bustle of it all, that perpetual inventory went by the board, and now we are no nearer to it than we were last year. The question now is: Are we going to be caught in the same pinch that we were in last June with classes and examinations on the one hand taking up every moment of the day, while on the other hand, we were busy gathering up the loose ends in the shop, planning, ordering, and installing new equipment, and on top of it all, fussing with that inventory?

Well, if we do not want to be caught in that fix, now is the time to start. It is a late start, 'tis true, but it is not too late as yet. The only thing is, we must start, not shortly, but right now. Let's go.

MEXICO SETS AN EXAMPLE

For generations the world has laughed and stormed and scolded at Old Mexico. Her serio-comic revolutions, her frequent changes of presidents, and her drastic methods of getting rid of them, together with many of her peculiar customs and ideals, have inspired the rest of the world with a sort of distrust, disrespect, and amusement.

But now comes word in the daily press that Mexico is about to set one of the finest examples of forethought, appreciation, and statesmanship that any country has yet shown. The matter in mind is the recently expressed attitude of the Mexican government toward its teachers. Let it be granted that in the past, Mexico has shown the worst possible attitude toward certain groups of its finest educators. However, it is more than sensational to have a country like Mexico announce that hereafter its teachers shall be regarded as national heroes and heroines, that they shall receive national recognition as national benefactors, and that when they die, they are to receive the burial and the honors reserved for the heroes and the heroines of the nation.

For the most part, the heroes of every nation have been warriors, the messengers of death and suffering and disaster, and it is well that nations honor those who have unselfishly laid down their lives for what they conceived to be their

country's protection and honor. Strangely, however, the world has been exceedingly slow to honor those who, no less than soldiers, have laid their lives on their country's altar, and have made a *living sacrifice* for the honor and glory of their country and their countrymen.

It is almost unheard of in America to build a monument in honor of an educator or a school teacher. There are, of course, such instances, but they are exceedingly scarce, and usually they have been built in honor of some other service than that of teaching.

For real service, for unselfish devotion to the welfare of others, and for unmatched sacrifice in the interests of the children and the youth of our land, who can hope to stand alongside of the teachers of our elementary schools, our colleges, and our universities? The teachers may not belong, for the most part, in the Hall of Fame, for fame has been neither their lot nor their ambition, but in the Hall of Gratitude and the Temple of Justice, they *deserve* places of honor.

May we not take a lesson from our neighbor on the south and start a movement in America to place our teachers, *who live their lives* for the glory of their country and their people, on the same level with those other heroes who *give their lives* in battle for their country?

PATTERNMAKING AS AN INDUSTRIAL ART

The small headway which the subject of patternmaking has made as an industrial art, aside from its vocational value and significance, has been surprising to the editors of the INDUSTRIAL-ARTS MAGAZINE.

So far as *industrial education* is concerned, it would be difficult to find a type of work so rich in information and so fundamental to a variety of industries. True, patternmaking is rapidly undergoing changes. So is furniture making, printing, and most other trades, which for industrial-arts purposes, are still being used extensively in their original and simpler forms.

Especially for the industrial-arts work in a general shop of the junior high school, elementary patternmaking may be used in a most interesting way. It involves the reading of working drawings and blue prints with their interpretation for purposes of patternmaking. It involves a knowledge of certain metals and their action under heat, and the allowances that must be made for such action. It involves certain simple principles of machine-shop work of the more elementary sort. It provides a most interesting type of woodwork within easy reach of the junior-high-school student, if the projects are wisely selected. It involves the knowledge of simple cores, the acquiring of information about sand, its use for molding, and the process of drawing the pattern from the sand. It requires knowledge of metals and how they are melted and poured.

Probably no other form of shopwork requires such complete and such thorough processes of thinking as patternmaking. The subject is completely filled with industrial information and significance. It deserves to find a larger place in the industrial-arts shops.

LENGTH OF TRADE COURSES

That we are confronted with a waste of time in our trade schools today is a subject to which industrial leaders and representatives, as well as those interested in schoolwork seem to be giving some thought. The educational director of one of our national industrial associations recently made the following statement at a large eastern university: "Through intensive training of from three to nine months, a boy can be trained to enter industry successfully in most trades."

This statement, coming from a person who is in direct contact with schools and industry, has a particular significance. With some it might find a ready acceptance and if allowed to spread might result in a change in some of our present programs.

There are two ways of viewing the length of trade courses, viz.: from the industrial standpoint and from the educational standpoint. Education is concerned primarily in producing boys and girls capable of living as well as earning. Industry, too many times, is interested solely in its material product and the financial return for its investment. The problem of the school is quite different from that of industry.

If the public schools were operated primarily for industry, the statement under discussion would, no doubt, be true, provided industry could offer the training in moral character and citizenship which the boy would lose by entering industry from a year to a year and a half sooner. The longer a boy is held in school, the more time he has to be under the influence of good teachers, to see more clearly his responsibilities for good citizenship. This training is of much more relative importance than turning out boys to enter industry.

It is well to have a frank criticism from industry and to reflect upon the criticism, but it is also well for industry to consider that the success of their enterprises depends to a large extent upon the moral fiber of its workers.

It might be possible to train boys to enter industry successfully in less time than the schools now take, but it is a question whether or not it would be wise.

LIKE FATHER LIKE SON

At the annual dinner given in honor of the high-school-band boys, two proud dads who had been chums when they were schoolboys together, sat facing each other in the dining hall of the new million-dollar schoolhouse.

"These boys certainly do have it handed to them," remarked one proud dad.

"Don't they though," responded the other.

"Quite different when we were kids, hey?"

"Well, I should say so! It was 'toe the chalk mark' in those days."

"Yeh! Walk to school and back home; do the chores; go to bed; get up at five in the morning and do it all over again."

"Yeh! It's mighty hard to raise children right with all of this modern luxury. My boy is girl-struck and smokes cigarettes at sixteen and I can't talk him out of it."

"Yeh! That's the way of it nowadays; your dad would have licked it out of you with a good birch rod, I bet."

"No! Dad tried to talk me out of smoking, but I got started early and wild horses couldn't have pulled me away from it. You remember how we used to smoke behind the barn when we were little shavers?"

"Yeh! That's right. And do you remember how we used to hitch up after dad had gone to bed and take those Jones girls out for sleigh rides?"

"Yeh! Those were the good old days, hey?"

"Yeh! Let's get out of here and have a smoke."

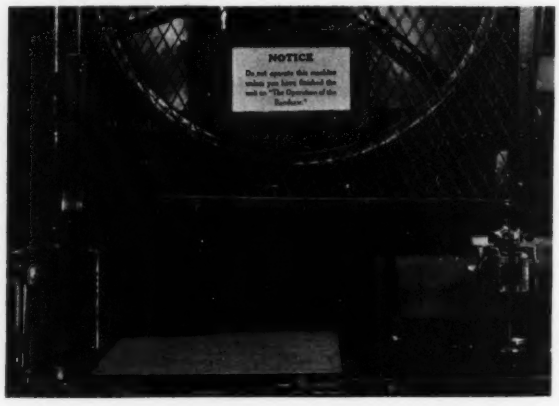
Manual Training

Manual training of the trade-school variety is appreciated by the average school board because all men appreciate more or less the value of a girl learning to sew; and of a boy knowing how to hit a nail and saw a board; they can even see that mechanical drawing may be a good thing to know something about, inasmuch as accuracy of construction depends upon it. But that art has anything in common with industries is still a matter of conversion, and that drawing is the universal language of industry is still to be learned.—*Alice V. Guyse.*

SAFETY IN THE WOODWORKING SHOP

C. S. Hentzell, Milwaukee Vocational School, Milwaukee, Wisconsin

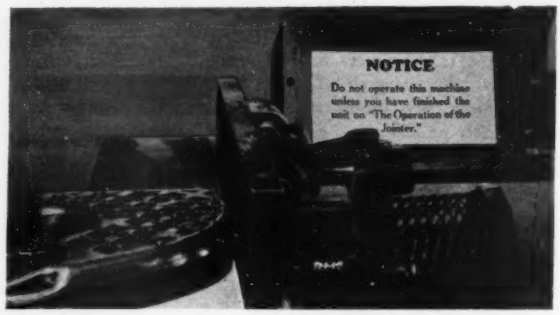
THE SAFETY FACTOR in the woodworking shop is one which every instructor must constantly keep in mind. Too much emphasis can hardly be placed upon the importance of exercising care in the operation of high-speed machines. It seems to be an unfortunate fact that a boy develops a sort of "I-know-it-all" attitude after he has used the machines several times. Having used the machine a number of times without mishap, he begins to feel that danger is a sort of myth and does not exist to the extent that the instructor seems to think. If this frame of mind were permitted to grow in the boy, it would not be long before a finger or some other part of the boy's anatomy would be missing. It is clearly the duty of the instructor to keep before the boy a constant reminder of the danger lurking in every woodworking machine. In order that the boy will not forget the importance of care in the operation of the machine, the following procedure governing the use of machinery has been put into practice in the patternshop of the Milwaukee Vocational School:



Each machine has been provided with a printed sign to the effect that no boy is permitted to operate the machine until he has finished the lesson sheet on that particular machine. These signs and the method of posting them are shown in the accompanying photographs. The signs serve to bring to the boy's attention the fact that special instruction regarding the operation of the machine is necessary before the machine can be started. This is an important factor in a school where new students are entering throughout the year. If a new student tries to start a machine he finds himself facing the sign which is so arranged as to come directly before his eyes when he grasps the starting lever. In practically every case the machine is not started, but instead the boy reports to the instructor for the lesson concerning the machine.

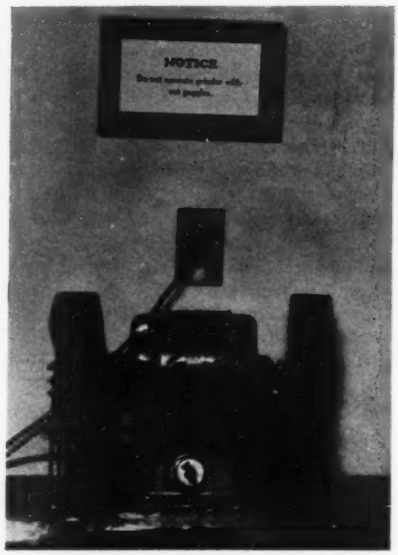
The lesson or unit sheet which deals with the operation of a machine, explains the proper method of starting the machine as well as the method of using it. In addition to this there has been added a list of danger points for that particular machine. This list does not set forth what *might* happen as a result of carelessness or lack of care, but lists instead the accidents that *have actually occurred* on such a machine. This list of actual accidents has been prepared from the reports covering such accidents in the various woodworking plants in the city. These incidents seem to have the proper effect upon the students to the extent that caution is exercised in avoiding the hand positions, etc., which have resulted in accidents. The very fact that these accidents have been called to the attention of the boys has had a notable influence in reducing careless operation of the woodworking machines.

The last page in the unit sheet is ruled for the instructor's signature and grade mark for the lesson. This signed page



represents the boy's written permit to operate the machine. This blank is not signed by the instructor until the boy has started and used the machine in the presence of the instructor.

Although the danger of a bad cut or a lost finger will always be at hand, the operation of the above system of signs and lesson sheets, seems to have gone a long way toward reducing carelessness in the operation of machinery. Another phase of the above procedure which is vital to the instructor, is the written and signed proof of the boy's instruction in the use



of the machines. In case of an accident no boy can say that he was not shown how to use the machine. If he had not been shown, the sign served as his warning to refrain from operating the machine. If he had been shown and had finished the unit sheet as directed, his answers to the questions would show that he knew of the danger. These are points which no shop instructor can afford to overlook. An accident is always a source of regret to the instructor, but it may be doubly so if no proof of individual instruction to the student can be shown.

MANUAL-ARTS TESTS

Paul V. Wilcox, Instructor, Manual Arts, Walnut Junior High School, Grand Island, Nebraska

New-type examinations, sometimes called objective tests, have some advantages not found in the old-type or essay test and are being used more and more in the industrial-arts field.

The term objective test probably comes from the fact that if the test is corrected or graded by two or more competent examiners the result will be approximately the same. It has been shown by numerous experiments that this condition does not hold true of the essay test, where results differ very radically due to the personal judgment factor entering into the appraisal of the answers.

One decided advantage in the new-type test is the fact that writing is reduced to a minimum and the instructor is enabled to get a larger sample of the information the student is expected to know, thus getting a more accurate estimate of the ability of the student.

The instructor need not be influenced by such items as neatness, spelling, or composition. These items play a part in making an estimate of the essay-test grade, sometimes consciously, often unconsciously. The answer is right or it is wrong in the new-type test, and would be graded the same whether the grading were done after a hard day at the shop, or after a refreshing sleep or period of relaxation.

Economy of time is gained because when the questions are once made, they can be filed away and used again with alternate sets, changing from time to time as the subject matter changes. Economy of the pupil's time is gained because he does very little writing and so can cover more of the subject matter. Correcting papers becomes a matter of checking with a key and computing scores. This job can be turned over to a competent assistant if necessary, even though the assistant had never seen the questions or was not familiar with the subject.

The examination should consist of a large number of units in order that it gives a better sample of the student's ability and it should employ more than one type of response.

Some new-type questions used in home-mechanics work are given to illustrate the different types of response. These test questions are mimeographed and handed out to the pupil together with the paper for him to write the answer. If the instructor insists that all question sheets are returned to him, he can use the same test for different classes of the same work, while if the pupil is allowed to retain the questions, of course, the test would come into the hands of other pupils and could not be repeated. It is important, of course, that the number of the question and the number of the answer correspond and this is a part of the responsibility of the pupil being tested. In addition to these tests a performance test for skill is sometimes given. In the multiple-response type or "take-your-choice" type the student chooses the answer he considers to be right. In the true-false type the student is to decide whether the statement is true or false in the light of his shop teaching and to write in one of these words after the number on his paper. In the completion type he should fill in the word or words needed to make the answer correct.

Multiple-Response

1. A corrugated fastener is used in a joint to (hold the joint together), (hold the joint open), (save nails).
2. A screw driver or screw-driver bit should be sharpened with (a short sharp taper), (a bevel on one side), (a long gradual taper).
3. An awl is used (as a general all-round tool), (for starting screws), (for chopping up ice).
4. A ferrule on a lathe chisel, awl, or other tool is (to keep the handle from splitting), (to make a good grip), (to add an ornamental touch).
5. A sandpaper block is used (to keep the hand from getting hot), (to get more pressure on the wood), (to keep from rounding over the edges).
6. The bit of a soldering copper is made of copper because (it does not melt), (it carries and holds heat well), (it files easily).
7. The hot copper is dipped into the killed acid (to cool it), (to test the temperature), (to take off the oxide).
8. The metal added to muriatic or hydrochloric acid to make it "killed acid" is (tin), (zinc), (galvanized iron).
9. Solder is composed of (copper and lead), (tin and lead), (brass and tin).
10. If all supplies are not on hand in the home shop the copper may be tinned with the aid of (a soft brick), (a fire brick), (a piece of concrete).
11. In joining two hardwood boards by means of screws the hole through the outer piece should be (slightly smaller), (slightly larger) than the screw, and in the second piece the hole should be (slightly smaller), (slightly larger) than the screw.

True-False

1. A screw drives easier after being dipped in wax.
2. A corrugated fastener is used as an ornament to a miter joint.
3. One purpose of wood finishing is to bring out the grain of the wood and thus add to the beauty of the piece.
4. Wood is filled with wood filler to add to the weight of the finished piece.
5. Varnishing should not be done in a dusty room.
6. In painting or finishing one should always brush out at the edges.
7. Glazier points are used to reinforce a joint.
8. In sandpapering one should sand with the grain of the wood.
9. A soldering copper is made of half lead and half tin.
10. The soldering copper should become red hot before being used.
11. One flux often used in soldering is muriatic acid killed with zinc.
12. To do a good soldering job the surface to be soldered should be clean.
13. Fifty-fifty is a poor grade of solder.
14. Tinners' rivets are used to hold two pieces of sheet metal together.
15. The handle of the cookie cutter is hemmed to reinforce it.
16. Metal is center punched before drilling so that the drill will not have so far to cut.
17. A leaking fuller faucet is usually repaired with a leather washer.
18. When rewashering a faucet the faucet should be unscrewed from the line.
19. A self-closing faucet is usually installed in residences.
20. Threads on water pipes are painted before assembling to prevent rust.
21. The object in cleaning the wire so thoroughly is making an electrical splice is to make the tape hold better.
22. An electrical splice should be just as good as the wire itself both electrically and mechanically.
23. A push button in a bell circuit serves to open the circuit when not in use.
24. A bell-ringing transformer changes the current from alternating to direct current.
25. The purpose of a fuse is to protect the electric circuit.
26. Any good fuse may be used in any circuit.
27. Underwriters' knots should be used in hooking up an extension cord.
28. Plane blades should be sharpened on only one side.
29. Shellac gives a bright hard finish.
30. Filler is used to fill the pores and holes in wood.
31. Finishing nails are flat-headed.
32. Glue joints should be made with block planes or smooth planes.
33. Glue must always be used hot.
34. Pine is always soft and white in color.
35. Oak is used only for making furniture.
36. Paint will not stick to hardwood.
37. A board 1 by 12 by 12 in. contains one board foot.
38. Basswood is ½ in. thick.

Completion Test

1. The names of the parts of a try-square are.....and.....
2. The T bevel is used for the purpose of laying out and testing .....
3. The numerals stamped upon the heel of a handsaw indicate .....

4. When used for accurate measurement the rule should be placed .....
5. When the teeth of a saw are bent out alternately they are said to have .....
6. Oil is placed on the whetstone to .....
7. The size of a No. 5 bit is .....
8. In boring holes in wood one may prevent splitting by .....
9. If I wished to bore in metal I would use a ..... bit.
10. If I wished to bore in wood I would use a ..... bit.
11. The diameter of the hole which a No. 14 bit will cut is.....
12. The tool used for sawing metal is called .....
13. The plane used to make a glue joint on a long board is called ..... plane.
14. The plane used for planing end grain is called.....plane.
15. The tool used for rounding circular and curved work is .....
16. The tool used for cutting tin is .....
17. The saw used for sawing irregular objects from thin stock is called ..... saw.
18. The tool used to hold bits for lathe boring is called .....
19. The tool used to clean the dirt from between file teeth is called .....
20. The hammer used for riveting over a tinners' rivet is called the ..... hammer.
21. The saw used for fine accurate work is the ..... saw.
22. The tool most often used for boring a hole for a screw is called .....
23. The wrench used by plumbers for screwing in pipes is called a ..... wrench.
24. The set used for threading a rod and threading a hole drilled in metal is called a ..... and ..... set.
25. The square which carpenters use most is called a ..... square.
26. The parts of this square are the ..... and .....
27. The hammer which carpenters use most is called ..... hammer.
28. When the driving end of this hammer is rounded it is called .....faced; when flat it is called.....faced.
29. The lathe tool used for roughing down to a cylinder is called ....
30. The lathe tool used for smoothing the work is called ..... chisel.
31. The tool used for driving the lathe centers into the wood is .....
32. The size of a bit brace is determined by the .....
33. The tool used for laying out circles and arcs of circles is called .....
34. The tool used for measuring the inside diameter of an object is called ....
35. The tool used for measuring the outside diameter of an object is called .....
36. The tool used for making holes in leather is called ....
37. The tool used for laying out lines and marking on sheet metal is called .....
38. The tool used for cutting small rods or wire is called ....
39. The tool used for laying out a line to get a board to width is called..... .....
40. The tool used for riveting two pieces of sheet metal together is called .....
41. The tool used for putting a hole in the top of a cookie cutter is called .....
42. The tool used to make a hole so that a screw may be driven even with or slightly below the surface of the wood is called .....
43. The tool used in a bit brace for driving screws is called ....
44. The chisel used for cutting metal is called..... .....
45. The tool used for putting a "dent" in metal before drilling is called .....
46. The tool used for driving a nail below the surface of the wood is called .....
47. The saw used to cut across the grain of the wood is called ..... saw.
48. The saw used to saw with the grain of the wood is called ..... saw.
49. The tool used for turning over the edge to properly sharpen a scraper is called .....
50. The passage which a saw cuts as it passes through a board is called .....

WHY HAVE SHOPWORK IN THE FIFTH AND SIXTH GRADES?

Frederick M. Trumbull, Vocational Director, Rockford, Illinois

WHAT do fifth- and sixth-grade boys get out of school shops? A boy of this age is too immature to learn a trade. Even if he had capacity to acquire trade skill, it would not be right at this age to make him spend the hours in shopwork necessary to learn a trade. During his early years his need is for a broader general education. Specialized trade training belongs to a later period. When the boy is fifteen or sixteen years old, and has reached the senior high school, he may be ready to begin the learning of a trade, but in the elementary school the purpose and the methods of shop teaching are entirely different from that of vocational or trade training.

If fifth- and sixth-grade boys are too young for trade training, do we want to spend school money to equip elementary shops and hire trained shop teachers to work with these boys? Parents and educators have been studying this problem for a number of years. Any feature of schoolwork which involves special equipment and specially qualified teachers must justify itself in positive results. It must meet a recognized need. If shopwork in the fifth and sixth grades meets a real need we should provide it. The following values are apparent in elementary-school shopwork.

Manual training has some value as simply hand training, but a greater value comes out of early shopwork through the clearer understanding it gives the boy of history, geography, civics, and other school studies. The industrial arts which the school represents are the real and actual experiences of daily life. Social life, business life, and political life depend upon occupational pursuits. No matter whether a boy is eventually to become a mechanic, a civil engineer, a salesman, or a lawyer, he needs to get an intimate understanding of industrial conditions and requirements. Shopwork is the most natural avenue leading to such information. Shopwork opens up a rich field of live and interesting facts that make the other school subjects more real, more worthwhile, and more easily understood.

Shopwork a Developer of Judgment

The boy is a daily consumer of the products of industry. He wants to know how things are made and how men make a living. He lives in the midst of the many and varied activities by which food, clothing, household utensils, builders' supplies, machinery, tools, furniture, leather goods, etc., are produced. But even boy initiative and the drive of boyish curiosity are of little avail in piercing the great unknown of the facts and opportunities in the work-a-day world which lies so close around him. To learn the qualities and value of materials, to appreciate workmanship, to recognize the relation between training and skill, to come to an understanding of the organization of industry, the boy needs first-hand experience with actual tools and materials under the direction and guidance of a skilled shop teacher. This shop teacher must be not only skilled in the handling of tools, but must also be skilled in the handling of boys and able to help them interpret their shop problems in terms of their own life problems. These problems that the boy meets in the woodshop, in the auto shop, in the machine shop, in the plumbing and heating shop, in the printshop, give him a basis for better judgment. He learns to respect skill and quality of product. He becomes aware

of standards of service. He becomes a more intelligent consumer. He acquires ideals which eventually determine his social attitude and his standard of living.

Other Fruits of Shopwork

Shopwork is an important aid in the boy's physical development. It supplements play and physical training. The boy, using his hands to a purpose, develops muscular control and a general coordination of hand and eye. By giving the boy a chance to spend a little time every day or every week in learning to do simple work with the common tools which every householder needs to know how to use in the upkeep of the home, he gains the double advantage of physical development and the acquirement of knowledge and skill which is of universal value.

The greatest value that comes out of the boy's early experience in the school shops lies in its exploratory possibilities. The boy's experiments in constructive work and the investigations which he follows up outside as a result of interests aroused, give him not only a rich fund of general information, but at the same time open his eyes to the real opportunities in the world of work. Some of these opportunities have a strong appeal for him. He makes tentative vocational choices. He tests and readjusts these interests as he goes along. In so doing he saves himself from unfortunate and expensive blunders in later years. Finally, when at a more mature age he fixes his interest on a definite line of work, whether it be industrial, commercial, or professional, it will be his own willful choice and the result of a wider vision of occupational opportunities. Then he is ready for real vocational training.

What About the Girls?

Sewing and cooking for girls in the fifth and sixth grades naturally parallel shopwork for boys. The needs of girls at this age are similar to the needs of boys. Their interests lie in different fields but they need opportunities for handwork the same as boys do. They need to actually handle the materials and tools involved in homemaking. Ideally, the home should provide these opportunities but we know that ideal conditions in this respect are not even approached in the majority of homes. Most mothers work under comparatively high pressure. They lack the time and in many instances the patience and skill necessary to teach the little girl the things that can be taught well in the sewing and cooking classes. Even with the advantage of the best of home opportunities, the school sewing room and cooking laboratory supplement, extend, and make still more meaningful to the little girl the things her mother teaches her at home.

We learn in four ways, (*a*) through observation, (*b*) through conversation, (*c*) through reading, (*d*) *and through doing things*. The actual handling of materials, tools, and products forms the basis of our judgments in observation, in conversation, and in reading. School shops for boys and sewing rooms and cooking laboratories for girls are, therefore, just as essential in the fifth and sixth grades as blackboards and books.

WHAT THE BEGINNING AUTOMOBILE-REPAIR STUDENT SHOULD BE TAUGHT

S. M. Pierce, South Bend Vocational School, South Bend, Indiana

A large and increasing number of junior high schools are including a course in automobile repairing in their curriculum. Some of these auto courses are called "Beginning Automobile Repair" or "Elementary Automobile Repair" but these terms are erroneous, for such a course must be made fairly representative if it is to assist the student to more intelligently elect his trade course.

Beginning automobile repair should be made a part of the automobile-repair trade course and should be a prerequisite to advanced automobile repair. The two parts of the course need not be taught by different instructors; in fact, if one instructor teaches both, he can better check up on the progress of each student. If one instructor presents the beginning and another the advanced automobile repair, they should be located in the same shop or at least in the same building, so that constant contact can be kept, insuring against overlaps and gaps in the course.

The writer is a firm believer of using, in part, the "commercial-job" method of teaching automobile repair, having used this method for ten years. Realizing, of course, the "grief" and hard work that goes with this type of instruction, one also realizes the tremendous value of instruction on live jobs, cars that have to go out and give service in the hands of their owners just as if they had been repaired in a garage. It is true that raw beginning students cannot be turned loose on a commercial job. They will have to get their initial experience on cars and units belonging to the school shop, but after a short time they can be allowed to do some simple commercial job that may fit in with the instructor's program. Such a job can often be "borrowed" from the advanced shop. Here the instructor will have to be very rigid in his inspection.

The first instruction should be given with the class grouped around a stripped chassis that is in running condition. This chassis should be the make most popular in that territory, preferably not a Ford, although that make should be available. Here the instructor points out and names the various units, explaining their functions and their relation to each other. This lesson can be called "the chassis." Succeeding lessons should take the component parts separately and show how they work, the attention they should receive, the ills they are subject to, bearing in mind the fact that these first few lessons are not to deal with repair methods so much as design, construction, and function. The points to be noted are somewhat as follows:

The Chassis

Frame; spring; axles; engine with its accessories such as the carburetor; ignition unit; wires; spark plugs; exhaust and intake manifolds; fan; water-pump; radiator; vacuum tank; oil lamp; starter; generator; battery; switches; throttle. Of course, it is obvious that a brief word of explanation should be said of each one of these accessories. Continuing with the other units, we have the clutch, transmission, universal joints, propeller shafts, brakes, steering gear, steering knuckles, etc. The chassis should be jacked up securely and operated so that the students may observe these units in action. This lesson should not be hurried. It may need two or more periods as it is possibly the most important lesson in the whole course and a backward or bashful student may say he understands when he does not.

When elaborating on these units later, the instructor should point out such salient points as

The Frame:

Why use channel steel? Why use hot rivets? Why have corner braces, cross-members, and why avoid drilling the frame? Other obvious suggestions will present themselves to the instructor.

The Springs:

What kind of steel? Purpose and care of the shackles. Proper lubrication, possibility of spring breakage, other duties of the spring such as resisting axle torque, propelling the car when no other unit is provided for this purpose. A portion of the class should dismount and disassemble a spring, using the proper tools and performing the operations in the proper order. A lesson sheet for this job should be provided not so much as an aid to the instructor at this time, but to get the class in the habit of following printed instructions.

Rear Axle:

The supporting housing, axle shafts, bearing, bevel gears, lubrication, differential, etc. Types of axles, such as full floating, semifloating and nonfloating, are not so important at this time but may be left to the discretion of the instructor.

Front Axle:

What kind of steel? How is steering to be accomplished? Knuckle bushings and knuckle pins. Wheel bearings, wheel alignment, etc.

The Engine:

When the instructor presents the automobile engine to his class, he is bringing a raw and untried group of boys in contact with a very delicate and complicated piece of mechanism and his problems will begin to multiply, but if he delays this too long he will dull a vital interest that is essential to the successful teaching of automobile repair. Each boy is eager to get into this unit and see what makes it go. It is almost impossible to itemize the things that should be explained about the engine as they are so varied and so numerous. However, we can think of some that need not be mentioned to a beginning class of boys:

Cycles: Make no mention of the two-cycle motor, or if you do, it should not be stressed at this time. Explain the four strokes of the piston, valve action, using a cross-sectioned cylinder if possible. Explain firing orders. Mention the igniting spark but do not go beyond the spark plug in tracing the source of this spark.

Valve Timing: Don't elaborate on degrees of opening and closing; top and bottom dead centers are close enough at present. Mention valve-timing marks on the timing gears.

Carburetion: Explain the float; the mixing of the air and the gasoline; adjustments; throttle, etc. Do not dwell on metering pins and venturi-tubes.

Compressions: This should be covered quite thoroughly, showing to the class valves that are not seating, piston rings that are not seating, engines that are missing or losing power because of lost compression. This would be a good time to do some valve grinding under the instructor's careful supervision. He should set the valve clearance himself.

Other parts of the engine, such as pistons, wrist pins, connecting rods, crankshaft, camshaft, flywheel, bearings, etc., can be explained but the instructor should not talk too much about fits and clearance. Gauges can be used to show out-of-round cylinders, flat crank pins and worn wrist pins. The instructor should handle these instruments himself. Avoid discussion of the electric system as this is confusing to a beginner.

After the student learns something of the operation of the automobile engine he will see very readily that it cannot be started under load, and that a transmission and clutch are necessary to operate the car. These units can now be explained to him and representative units taken apart and reassembled. Always insist on complete and proper assembly or the student will acquire lax habits. The universal joint, propeller shaft, brakes, torque members, steering gear, and control units should present no serious difficulties and in a short time the class should have a superficial knowledge of the entire car. Having done a few simple jobs in an assembled group, the class should now be broken up into smaller groups, two or three boys each, and assigned appropriate jobs.

Before general work is started the matter of shop routine and shop discipline should be made clear to the boys. A toolroom boy should be selected if there is a toolroom. If there is only a tool panel, one boy should be made responsible for seeing that the tools are clean and in place at the end o the period. Perhaps the instructor will want to appoint a sho "foreman." The nearer a shop atmosphere, rather than classroom atmosphere, the more successful will be the instruction. The sooner the instructor makes the class responsible for the appearance of the shop, responsible for removed parts, responsible for the tools, etc., the sooner he will have a satisfactory working group and the smoother things will move. It has been found advisable, in some shops, to compel each student to purchase a small, standard kit of tools. Better work is done and a sense of responsibility for shop tools is instilled in him.

Students can learn about a large number of things by studying mounted articles, such as cap screws, stove bolts, castellated nuts, S. A. E. and U. S. S. threads, machine screws, cotterpins, taper pins, woodruff keys, setscrews, lock washers. The use of taps, dies, drills, reamers, and screw extractors should be learned by observation in the instructor's hands and by careful supervision by the instructor. The student will gradually become familiar with the properties of common metals and metal-cutting tools.

Types of commercial jobs that are safe to attempt with beginning students are: locating missing cylinders, cleaning spark plugs, adjusting valves, removing carbon, grinding valves, aligning wheels, lining and adjusting brakes, changing tires, oiling and greasing the car, tightening bolts and nuts, installing accessories, etc. A large number of such jobs can be found and they are desirable because they are moderately simple and are easy for the instructor to inspect.

Lack of space permits only a word regarding related subjects. Machine-shop practice, electricity, mathematics, science, and drawing are of utmost importance. Electricity should not be given until just before the advanced part of the automotive course as it incites a tendency to experiment. Machine-shop practice should come before or during the beginning course. In fact, a lathe, drill press, and grinder should be a part of the shop equipment. Among other valuable things it will give the student an idea of how metals are cut, so that hand tools will be used to better advantage. Mathematics, science, and drawing are always valuable to metal-working and building-trades courses.

Suggestions to the Instructor

Never permit the boys to feel that shop discipline is less rigid than classroom discipline.

Never allow boys to get the play habit or loafing habit when they come to your shop.

Don't allow promiscuous whistling, singing or talking, since we hear too much of that in shops.

Watch all work carefully to avoid unnecessary disassembly and premature assembly.

Never attempt repairwork on a unit until the student understands the principle of operation of that unit.

Never assign more than two or three boys to a job unless a class demonstration is being made.

Never attempt a commercial job that is too far advanced for your class.

Do not attempt a job that does not come within your program of instruction.

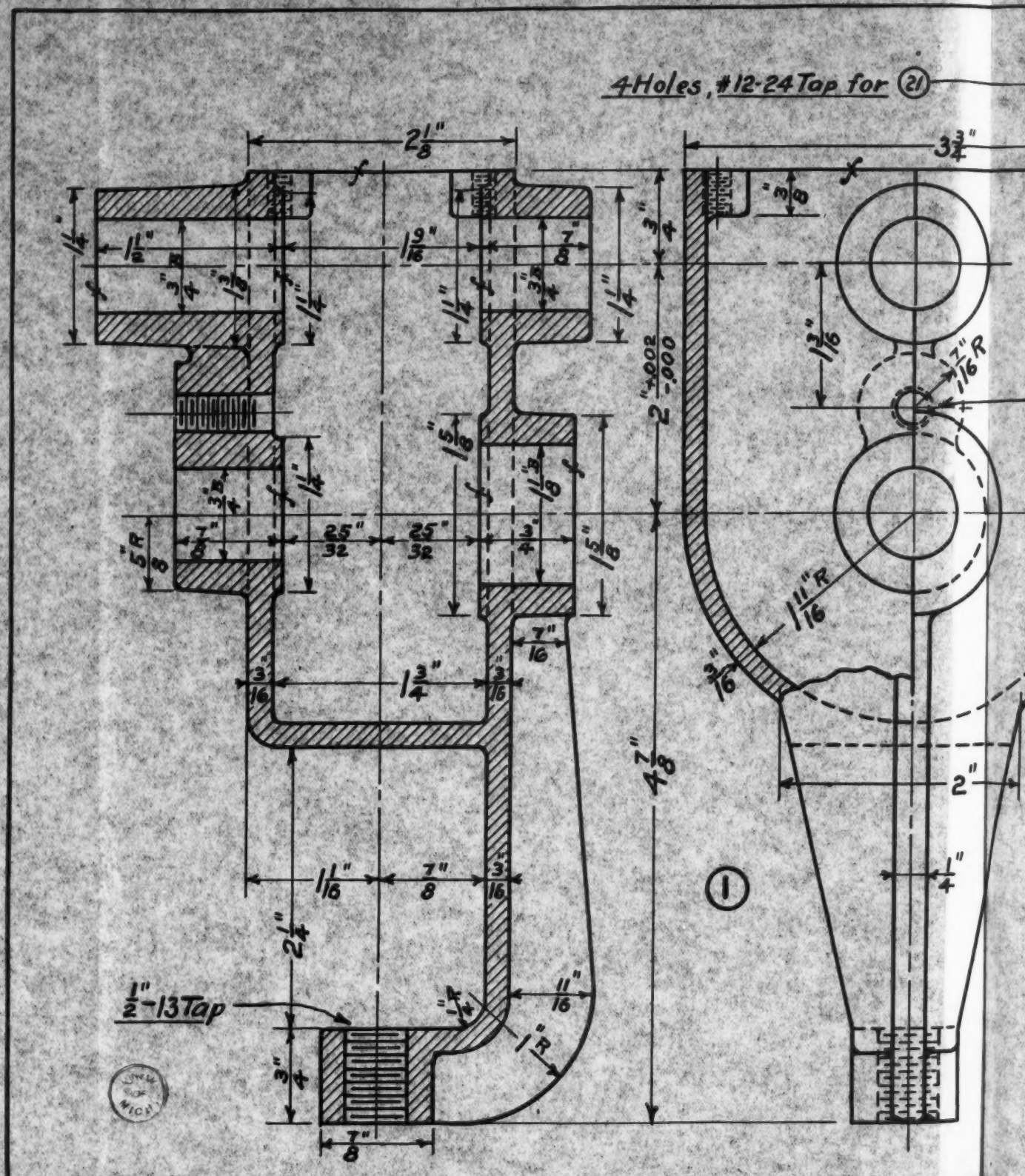
Always insist on your instructions being followed to the letter. Use job sheets and reference books.

Don't start a student on a job without telling him what the nature of the repair is to be.

Check up on your instruction occasionally with written tests as well as oral quizzes.

Remember, always, that you are teaching boys, not just a course.

TRACING SUPPLEMENT No. 85,
THE INDUSTRIAL-ARTS MAGAZINE,
MARCH, 1928



Designed by R. F. Davis, Hibbing Jr. College, Hibbing, Minn.

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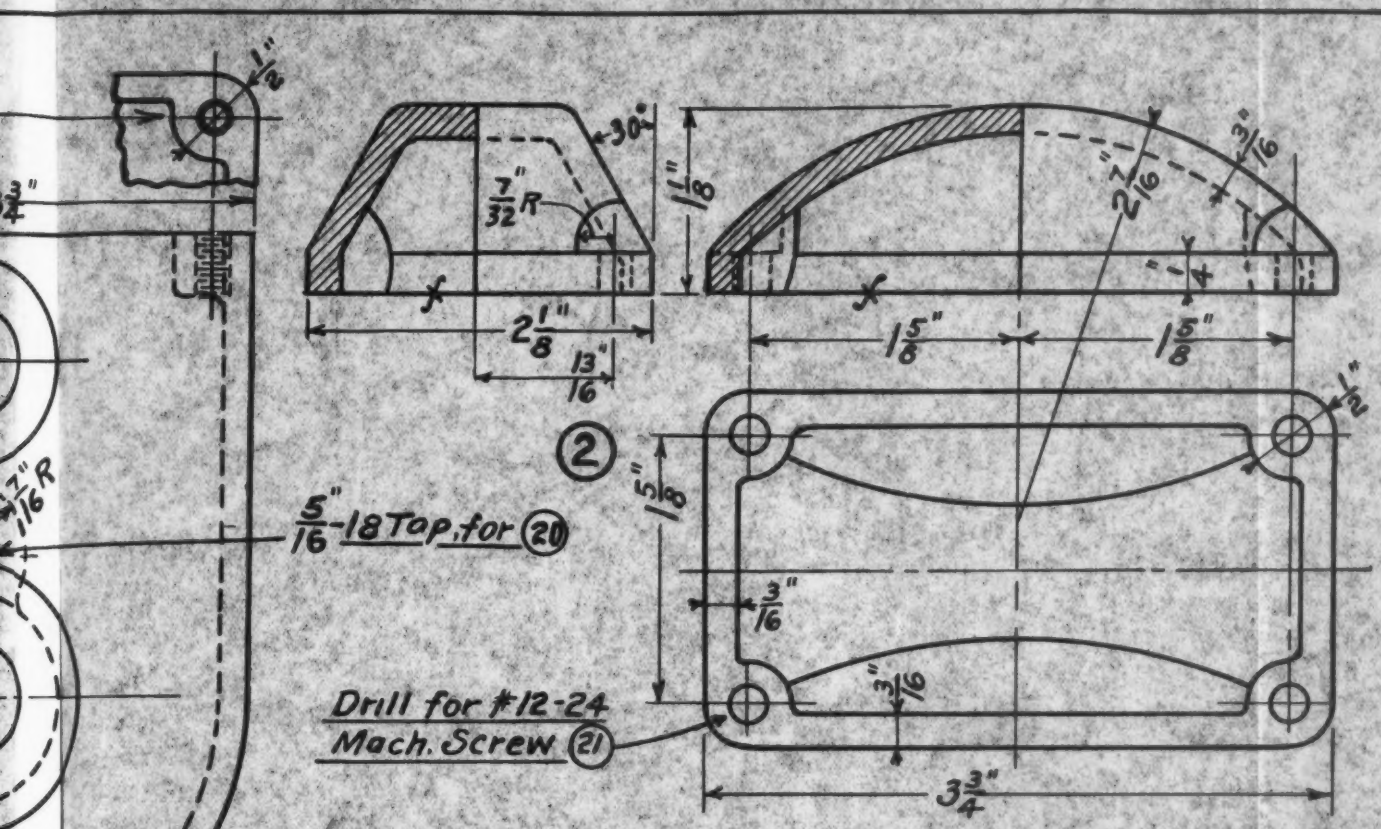

No W.	PART	MAT	REF #
1	Frame	C.I.	1
1	" Cover	"	2
1	Crank	Brass	3
1	Drive Gear	C.I.	4
2	Int. " "	"	5
2	" Pinions	Bz.	6
1	Drive "	"	7
1	Spindle Bushing	"	8
2	"	"	9
1	Drive Shaft "	"	10
1	" "	CR.S	11
1	Wheel Spindle	"	12
1	Clamp Screw	"	13
1	Handle "	"	14
1	Clamp Screw Bar	"	15

No W.	PART	MAT.	REF #
1	Wheel Collar	CR.S	16
1	Clamp Screw Cap	"	17
1	" Bar Ball	"	18
1	Spindle Nut	St.	19
1	Hex. Hd. Cap Screw	"	20
4	Fil. Hd. Mach. "	"	21
2	End Plugs	"	22
1	Tool Rest	"	23
1	" " Washer	"	24
1	Pin for Crank	"	25
1	" " Dr. Pinion	"	26
1	Crank Handle	Wood	27
1	Cover Gasket	Paper	28
1	Wheel, 5" Diam. 3/4" Thick	Emery	29

DETAILS FOR BENCH GRINDER

GE

For Description See Page 100, Industrial-Arts Magazine, March, 1928.

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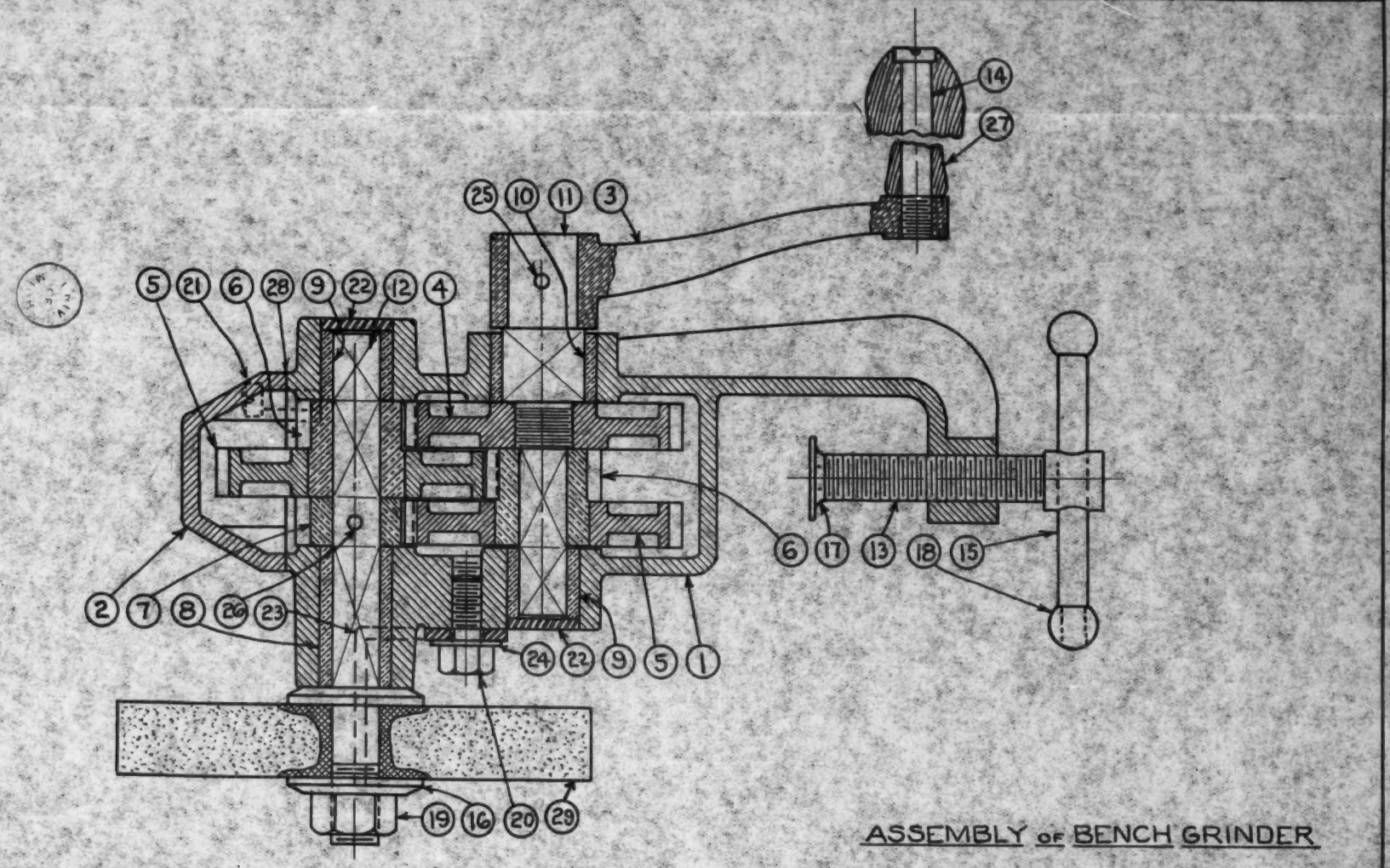

ASSEMBLY OF BENCH GRINDER

Designed by R. F. Davis, Hibbing Jr. College, Hibbing, Minn.

For Description See Page 100, Industrial-Arts Magazine, March, 1928.

TRACING SUPPLEMENT No. 87,
THE INDUSTRIAL-ARTS MAGAZINE,
MARCH, 1928

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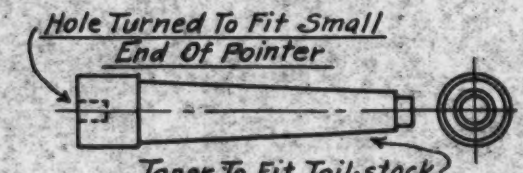
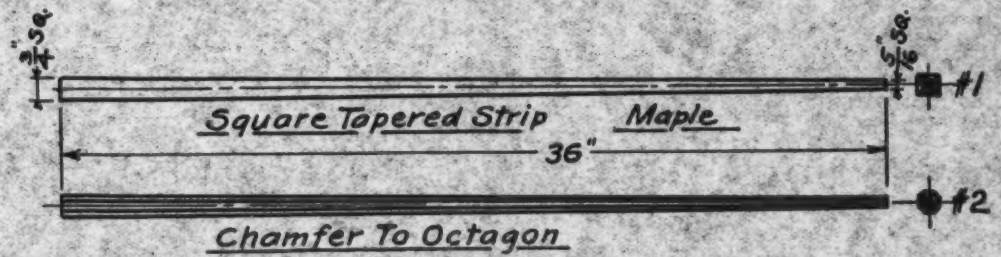
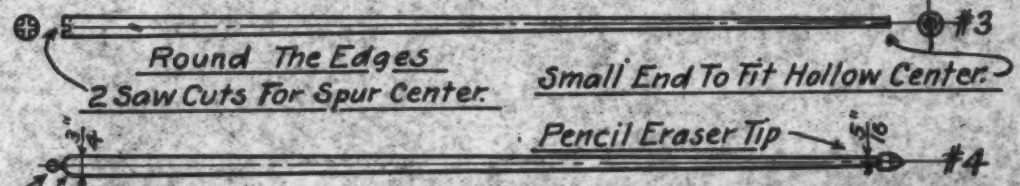


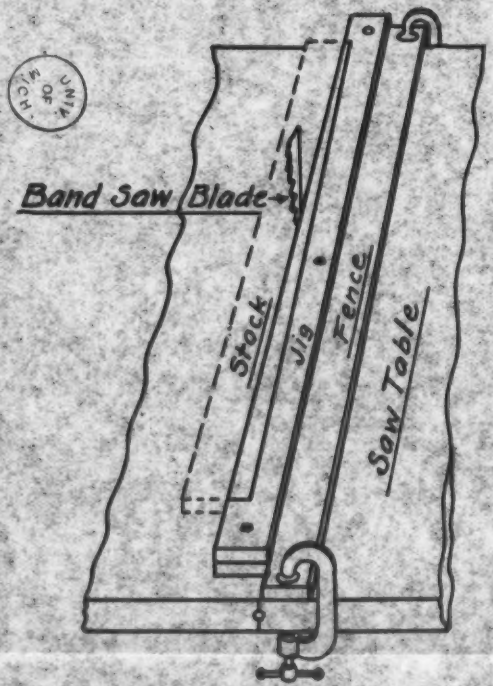
Hollow Center Turned From Maple.

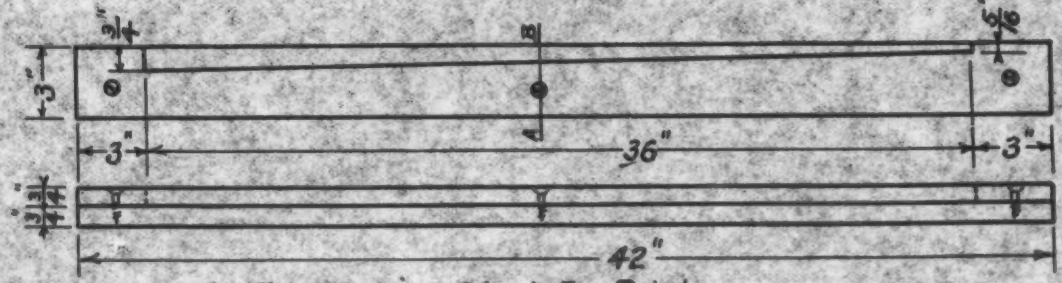


Chamfer To Octagon



Chuck Between Centers And Sandpaper Smooth.
Finish With Shellac And Oil.



Jig To Move Between Saw And Fence.

Jig For Sawing Stock For Pointers.

Section at A-B

TEACHER'S POINTER

GE

Designed by Russell E. Norris, Endicott, N. Y.

For Details See Page 198, Industrial-Arts Magazine, March, 1928.

COOPERATION OF PARENTS WITH THE WOODSHOP TEACHERS

T. P. Fiske, O'Keefe Junior High School, Atlanta, Georgia

In my experience as a shop teacher, I have found that if one secures the cooperation of the parents in the things that are being done in the shop, the pupil's interest will be naturally increased. I have found that if a boy's father or mother visits the school, and if they discuss with the instructor what they wish their son to make for the home, the boy will show twice as much interest in his work as he does when he is working on a project laid out by the instructor only. In many cases, the suggestions from the parents are enough to start the boy designing a project for the home. This is the most valuable training for the boy in his shopwork.

A number of methods were tried to arouse the interest of the boy in his work. At first, prizes were offered for the best pieces of work. This method worked fairly well at first, but if it is not kept up, interest wanes and the boy does not want to work except for prizes. A second method was to allow the boys of the ninth grade to take orders for their work and make money on their projects. This also brought results, but was not satisfactory because it got the school into conflict with the labor organizations. A third method was to allow the boy the privilege of designing his own problem provided it embodied the prescribed shop and tool operations, and that it was designed on sound principles of craftsmanship. This worked successfully, and was better than either of the foregoing plans. The only difficulty experienced was the fact that the boy usually chose projects which were too far in advance of his learning and strength, and the designs would then have to be modified to suit the individual.

The foregoing methods all served to create interest in shopwork, but the best results were obtained when a circular letter was sent to the parents, asking them to offer suggestions.

Almost 100 per cent of the parents responded, and the students' interest in the shop problems advanced materially.

The following is a copy of the letter sent out:

Dear Parents:

I am writing this letter in order to secure your cooperation in establishing a closer relation between the school and the homelife of the pupils. In order to arouse the interest of the boys in my shop classes, and in order to show them how to apply the knowledge gained at school to their work about the home, I am asking that each boy bring one project from home to be repaired in the school shop as a part of his regular work.

This project may be one of the following things: Chair bottoms to be replaced, furniture to be refinished, or parts of furniture to be made to replace those that are broken.

I would be glad also if you would suggest to your boy some piece of furniture you wish to have made, and I will be glad to assist him in making it.

The only cost to the student will be the actual cost of the material used. In most cases this is covered by the fees already paid by the boy.

Hoping that this plan meets with your approval and that we can stimulate the interest of your boy in his shopwork, I am,

Sincerely yours,

T. P. Fiske,
Instructor of Woodworking.

TWO COMMENCEMENTS

Laurence Parker, Kansas State Teachers' College, Pittsburg, Kansas

A commencement invitation from Fred A. Smith has just come and lies before me on the desk. It reminds me of another which came to me a couple of years ago. I am reminded because of similarity of names and for another reason which not be told in a single sentence.

Frederick Arthur Smith sent his commencement invitation a couple of years ago. He graduated from a cosmopolitan gh school in a large city and everyone thought he had received all the advantages of a good education. He thought o, too.

The father of Frederick, it seems, had been watching this high-school education of his son during the four years and a great big question mark had built itself up in his mind. So, when the commencement invitations had gone out, the father had a talk with Frederick which ran about like this:

"You probably would like to go on to college with your classmates. I probably can afford to send you, too. But I am going to ask that you work for a year or so, one year at least, before going to college.

"I do not care what you do. I don't know of any jobs open. Here is the want-ad section of the newspaper. Find a job, and good luck."

Months later the father told me all about Frederick's experiences. Every day for two weeks he "pounded the pavement" hunting a job and using want ads as a basis. At last he secured a job selling washing machines. He was to ring doorbells, interest housewives and be paid a commission only on actual sales. "If there is any harder way to make a living," said his father, "I haven't learned of it."

Frederick stuck it out for several weeks until convinced that the road to fortune did not lie in that direction and then quit and started job hunting once more.

One day he knocked off hunting and called upon his old high-school principal. The following conversation ensued:

"What are you folks doing here, anyway?" said Frederick.

"We are educating young men and women. We educated you," said the principal.

"That *may be*," said Frederick, "but you haven't taught me a single thing apparently that anyone will pay me a nickle for. Good-by!"

What happened next? Oh, Frederick got a fairly good clerical job which tided him over the year so he could go on to college.

The commencement invitation before me states that Fred A. Smith is graduating from a vocational trade school which is nationally known and specializes in only one trade. I know that Frederick's diploma represented a four-year course. I am sure that Fred's is based upon proficiency and his accomplishment measured by trade standards.

Frederick's commencement is well named. It marks the time when he must commence to learn to do something for which the world will pay him.

Fred's commencement is also well named for it signifies his commencement to earn a good living at a good trade at a fair starting wage.

What makes me think that all this is so? Well, Frederick's father told me of Frederick's experience.

A classmate of Fred's went out on a job and two days later his boss wrote back to the school as follows: "Your graduate sat down to the keyboard at 9:30 this morning. Thanks to your effective instruction, he is now annoying me with insistent demands for more copy. Mrs. H—— was taken with him at once and he will room at our house. I feel sure I can send you a good report of him from time to time. Cordially yours," (Signed) Mr. H——.

You see there are two kinds of commencements possible for your children and mine. Which will make them happiest in the long run? Which is safest in these modern days? I don't know what you think, but Fred's commencement is what father used to call "All wool and a yard wide."

Vocational Guidance

Vocational guidance is concerned with helping children to choose, prepare for, enter upon and make progress in their careers, and in furnishing children with such vocational enlightenment as will equip them to solve cooperatively the larger problems of occupational life which cannot be solved by individuals alone. Vocational guidance is important, for one reason, because our vocations occupy about one half of our waking time of an ordinary day, and also because success or failure in one's vocation is intimately connected with the welfare of his total activity.—*John M. Brewer, Harvard University.*

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine-shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

A BENCH GRINDER

R. F. Davis, Hibbing Junior College, Hibbing, Minnesota

(Part 2)

(See Supplements Nos. 85 and 86.)

The case offers some unusual opportunities to demonstrate the usefulness and versatility of the milling machine. The material for the case may be either cast iron or aluminum. Aluminum cases will weigh about two pounds. The top of the case is machined in the shaper or on the milling machine. In case the miller becomes congested the boys may be kept busy at the bench vises filing the cases and cranks. The machining of the case holes and facing of the bosses on the inside require care but we have no difficulty in machining one case in a 100-minute class period. The case is gripped horizontally in the milling-machine vise, with the tool-rest boss on the top and the crank side of the case toward the milling-machine spindle. The upper spindle boss is carefully centered in front of the pilot drill which is run entirely through the case. A fly cutter is used to finish the hole to size. The table is now very carefully moved the correct distance to space the shaft holes and the same procedure is again followed to finish the lower hole on the wheel side of the case. At this setting, the large hole for the crank bushing should be bored with the fly cutter. The bosses on the inside of the case are faced with a facing cutter which is inserted through the top of the case and held in place with a small screw. The equipment used on this job includes a ⅜-in. collet chuck which holds a piece of round cold-rolled steel having a ¼-in. square hole near the end for the cutter. The cutter is held with a very short screw which has a slot for a screw driver.

The cover should be faced on the bottom and the screw holes laid out and drilled tap size. These holes are drilled tap size in order that the cover might be used as a jig for drilling the case, and the cover holes must be redrilled to permit the retaining screws to pass through them. The remaining holes in the case need no explanation.

The bushings should now be turned to a light press fit in the case and it is to be strongly recommended that they be pressed from the inside. Two of the bushings will not reach to the outside of the bosses and the spaces remaining are to be fitted with plugs to retain the oil.

In assembling the grinder a hand reamer is run through the upper bushings and the shaft is inserted and fitted if necessary so that it turns freely. The hand reamer may also be run through the two intermediate gear assemblies. The lower intermediate gear assembly should be put in first, then the first drive gear is slid into place and the drive shaft screwed into place. This assembly should turn freely. Now drop the upper intermediate gear into place and insert the spindle. This assembly should turn freely. The spindle may now be pulled out and the final drive pinion assembled in place. A ⅛-in. drill is then run through the final drive pinion and the spindle. Before inserting the drill-rod pin through this pinion make certain that the pin is shorter than the root diameter of the pinion or the pin may strike the teeth of the lower gear. This brings us up to the most exciting point in the construction of the project—the actual try-out. If the grinder cranks freely and without undue noise the work has been properly done. It is almost sure, that some of the grinders will have tight spots. Such jobs may be corrected by gripping the spindle in the drill chuck of a lathe or drill press, and running them in until they work properly.

The finishing touches include the cutting of a cover gasket, fitting of the oil-retaining plugs, and final polishing or painting. The final drive pin is retained by striking the metal on either side with a small flat-nose punch. The case should be filled to a depth of about ½ in. with a light machine oil. Do not use gear grease, since the upper spindle runs at a high rate of speed and grease will not be able to lubricate the bushings if they are properly fitted.

This grinder is an example of a type of projects which attracts boys to your department. It offers exceptional opportunity for varied instruction; it develops accuracy; it holds the attention and interest of the students; it has a practical aspect being useful around any home, and it is not expensive to make. If you are using the exercise method of instruction, why not liven up your course by making bench grinders?

SYSTEM IN THE SCHOOL PRINTSHOP

James E. Gaffney, Instructor of Printing, Allentown High School, Allentown, Pennsylvania

There is no doubt, that in a great many school printshops, the tendency is, or has been, to place too much emphasis on job production to the detriment of the instruction side which should be the primary purpose of the school shop. It is also true, that an efficient instructor who has his shop equipped in an up-to-date manner can increase production without impairing instruction by effectively routing the work.

The printing instructor should endeavor to have his superintendent of schools or his supervisor give him, at the opening of the school year, copy for all the printing that is to be done during that year. By this method the instructor will be in a position to eliminate jobs which are beyond the students' capabilities, and select such that can be made to fit in the teaching program and the instructional needs of his students. If the instructor has analyzed his trade, and has built up an effective outline of instruction, he will experience no trouble in making the proper adjustments. This method will also help in eliminating rush jobs which have no place in the school shop.

The foregoing course of procedure has been followed in the printshop of the Allentown High School for the past two years,

PRINTING DEPARTMENT—ALLENTOWN HIGH SCHOOL

SHOP ORDER

Order No. 613 Form No. H.S.-333 Dept. Job No. 32

For Mr. D. W. Hamm

Description of Job Reports, College Entrance in Arts

Quantity 500 Job Wanted July 1, 2

Stock Carnay, Aquawave Index Bristol

Size 25½x30½ 140 lb No. Pieces to Sheet 18

Stock obtained from Grant Buchanan Co.

Sheets required 43 Cutting Estimated Time 3 hrs.

Name Carl Gilbert

HISTORY OF THE JOB

Taken up by Harry Peffer April 20 192

Composition Estimated Time 4.2 hrs.

Composition by Student LeRoy Buchmeyer 4.5 hours

hours

Proof-reading done by Wilbur Kranch April 22 192

192

Correcting done by Warren Metz April 22 192

192

Proof sent to Mr. D. W. Hamm April 22 192

Proof returned by 192

Break up for colors by 192

Lock-up Estimated Time 3 hrs.

Locked up for Press No. 2 April 23 1925 by Benj Grunberg 1 hrs.

192 by hrs.

192 by hrs.

Makeready Estimated Time 95 hrs.

Makeready by Herschell Oswald April 23 192 85 hrs.

192 hrs.

192 hrs.

Running Estimated Time 162 hrs.

Running by Victor Musil April 24 hrs.

550 Imp. 2.5 hrs.

Imp. hrs.

Imp. hrs.

Ink used Boyd Black Multimarco Made by

Jogged up by Charles Dietz 192 hrs.

Shipped by James E. Gaffney April 25 192 hrs.

JOB ENVELOPE—ORIGINAL SIZE 8¼"x 11¼".

and it has been productive of good results. A requisition for printing must have the approval of the superintendent of schools, and of the principal or the supervisor of the school for which the printing is to be done.

When the requisition is received in the shop an entry is made in the job record book designed for the purpose, and at the same time the copy is placed in a job envelope upon which the specifications for the work have been written. The envelope then goes to the composing room where the time used in the different operations is entered by the student in the spaces provided for them. The envelope then travels to the stockroom where the paper is selected and cut. It is then relayed to the pressroom and so on until the finished job is wrapped and returned to the office with the ticket.

All information on the job envelope containing the amount of materials and time used on each operation of the job are then entered in the job record book. When a student shows ability he is set to estimating or finding the cost of each job. The "Typothetae

Standard Guide" and the "Franklin Price List" give the students an idea of the price that should be charged for a job. The stock sheets assist in keeping a perpetual inventory of all stock purchased. It also keeps a record of the jobs upon which each particular kind of stock is used. This facilitates matters in making out requisitions in ordering stock.

At the beginning of the school term every student is assigned a composing stick, line gauge, galley, and a case, lettered and numbered. Thereafter the student is held responsible for these items and must keep them in good condition. A type specimen book is also given to the student. Each style and size of type, and the different kinds of rule faces that are found in the school shop are shown in this book. The student indicates on his layout the style, size, and letter and case number of the type he intends to use on the job. This is submitted to the instructor and must have his approval before the job is started. In the same way, when type is ready for distribution, a proof is pulled, upon which the student indicates the size, style of type, etc., before starting his work. This scheme has proved to be of much value in keeping the cases clean and in helping the students in recognizing the different sizes and styles of type.

LIST OF JOBS DONE IN PRINT SHOP YEAR 192.... TO 192....

ORDER NO.	DATE OF ORDER	FORM NO.	WHEN FINISHED	DEPT. JOB NO.	QUANTITY	DESCRIPTION OF JOB	ORDERED BY	STOCK USED	INK USED
613	3½	HS-333	7½	92	500	Reports. (College Entrance ex) [Acts]	Mr. D. W. Hamm	Canary) Aguamm Index Bristol (Bond Block + Yellow Cod	

LIST OF JOBS DONE IN PRINT SHOP YEAR 192.... TO 192....

	OPERATIONS							COST OF MATERIALS								
	COMPOSITION	LOCKUP AND IMPOSITION	MAKE READY	RUNNING	CUTTING	FOLDING SEWING	COST	STOCK	INK	OTHER ITEMS	TOTAL COST	AMOUNT COLLECTED	DATE DELIVERED	REMARKS
92	13 25	2 50	1 45	2 85	75		21 00	4 15	15		25 50			

JOB RECORD SHEETS—ORIGINAL SIZE 14 BY 17 IN.

REQUISITION FOR PRINTING

Date 3-6-2

Request is hereby made for the following printed material from the High School Print Shop, as per attached sample.

Quantity	Description	Date Work Wanted
500	Report Cards	7-1-2
	College Entrance ex Acts	

Material to be used: Bond . Index Bristol ✓ . News . . Ledger . Cardboard . Book Paper . Cover Paper . .

Approved: D W Hamm Requested by: D W Hamm

Approved: H W Dodd

Note: Supplies are not delivered, but must be called for upon notification.

Stock Sheet No. C-8

Description Aguamm Index Bristol Cardboard. Size Weight Color

From Garrett Buchanan Co. 25½ x 30½ – 170 Canary

@ $12.20 per 100 sheets

Received R. O.	Reams	Sheets	Date	Price	Given Out Job No.	Reams	Sheets	Balance Reams	Balance Sheets	Remarks
		200	9/6	24.40	92		30		170	Report Cards

Record of Forms in Imposing Stone and Galleys for Press

Form No.	Job No.	Compositor's Name	Location L.B. or Shelf No.	Location Galley No.	Name of Job
HS-333	92	LeRoy Buckmaster	A-10		Report Cards ex Acts

REQUISITION—ORIGINAL SIZE 5½ BY 8½ IN. STOCK AND IMPOSING RECORDS—ORIGINAL SIZE 8½ BY 11 IN.

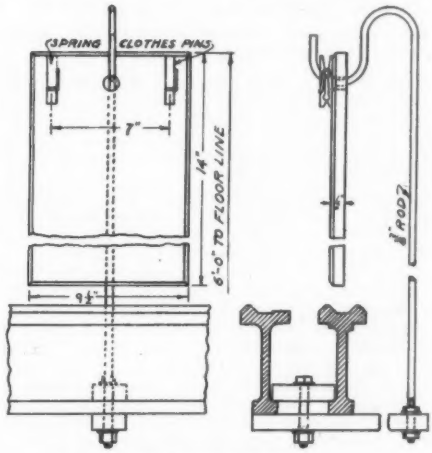
The equipment of the Allentown High School printshop is lettered in the following manner: Type cabinets, presses, and imposing stones are lettered A to M, inclusive. The cases are numbered consecutively beginning with cabinet A; labels on the cases give point size, name of type, printed specimen, cabinet letter and case number. The ornament cabinet which contains ornaments, initials, borders, and zinc etchings, has each case numbered. A book is kept on file containing proofs of all these materials so that one can get them quickly, and after use return them to the proper case and compartment in the ornament cabinet. In the stockroom the compartments for cardboard, book paper, writings, bonds, and ledgers are also lettered. As soon as the paper stock is checked up with the invoice and entered on the stock sheet it is placed in its proper compartment.

This system has been tried out in different school shops for the past thirteen years, and it has helped to eliminate confusion and to produce better work and better discipline. It also results in greater interest on the part of students because they are working in an orderly atmosphere, and prepares them for entry into commercial printshops.

BLUE-PRINT AND JOB-SHEET HOLDER

J. T. Hayes, Bucyrus, Ohio

That there should be a place for everything, and everything in its place is a policy as good in the school shop as elsewhere. Yet, often the blue prints and job sheets which are so necessary in schoolwork have



JOB SHEET HOLDER.

no particular place, and they can be found in the boys' pockets or under the tools on the tool board where they soon become lost or useless. To overcome this condition the holder shown herewith was made, and one placed on each machine with the result that all prints, sketches, etc., are kept in first-class condition, and where the maximum benefit can be derived from them.

The drawing is self-explanatory, a spring clothespin being nailed to the board to assure an effective means of holding the papers rather than depending upon thumbtacks. The method of fastening to the lathe is only suggestive, other ways being easily devised.

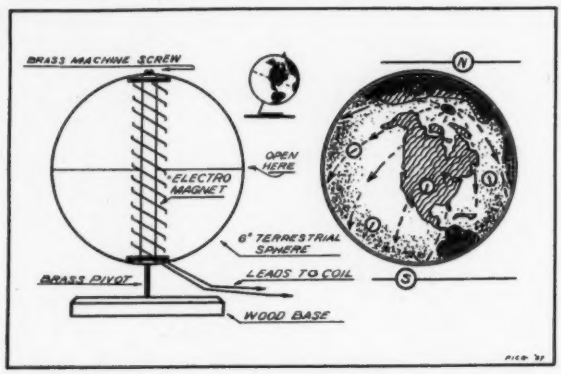
THE MAGNETIC GLOBE

Charles M. Rice, Everett, Washington

The illustration with this article suggests a method for depicting the scope of the inherent magnetism of the earth. Since magnetism plays an important part in the electromechanical machines of today, the student should be induced to see the small magnet in greater perspective, i.e., the earth as the great magnet that holds sway over all the lesser magnets.

To illustrate the magnetic field of the earth with a degree of realism, a 6-in. terrestrial sphere of pressed paper may be purchased. The wire stand and pivot is then removed and the globe is cut into two parts. This should be done carefully, and the inside diameter taken in order to determine the length of the magnet to be installed. The magnet is made as follows:

1. Cut a piece of soft iron to the proper length.
2. Bore and tap the ends of this bar for the machine screw for the binding post.
3. Force a fiber washer over each end.
4. Cover the iron core with insulating cloth or a layer of friction tape.
5. Wind with cotton-covered wire.



The illustration shows the magnet installed. The holes at the north and south poles are used to hold the magnet in place. If the deviation of the magnetic poles from the true axis is desired, new holes will have to be made at the proper places. A small compass may be used to show the direction of the flux at various positions on the surface.

THE PROPER USE OF LETTERING

Ray J. Matasek, Milwaukee Vocational School, Milwaukee, Wisconsin

Lettering, which is one of the most important phases of commercial-artwork, is a very interesting subject. As a rule, not enough time is given to the study of the proper kinds of lettering to be used for various purposes.

The lettering in Plate 1 will give you an example of some of the ideas which lettering can express.

The designing of letterheads was given as a problem in the commercial-art classes at the Milwaukee Vocational School. Plate 1 was used as a basis from which the students developed their designs. The letterheads in Plate 2 were the outcome of this problem.

Figure 1, Plate 2, shows a letterhead for Henry Montgomery who sells farm machinery at Hutchinson, Wis. Anything but a good strong modern letter would surely be wrong here. When we think of machinery we don't think of something dainty and graceful, but rather of something powerful, heavy, and strong. This should be expressed in the lettering.

Figure 2, Plate 2, is for W. H. Comstock, dealer in church statuary and supplies. Whenever we want to express anything that is connected in any way with the church, the Old English black letter or the uncial letter can always be depended upon to give the right atmosphere. These are the types of letters which the old monks made with their reed pens when making their marvelous old manuscripts. Modern novelty letters could not give the same feeling that is desired for anything connected with the church. The boy who made the letterhead shown in Figure 2 caught this feeling and expressed it admirably.

Figure 3, Plate 2, shows a letterhead for Frederick Staunton, interior decorator, which is a modern adaptation of the Roman letter. It is a dignified letter and yet it is dashing enough for modern times. The cipher in the center adds a great deal to the effect of the letterhead.

PLATE I. HOW LETTERING MAY BE USED TO EXPRESS IDEAS.

Notice how the letterhead, Figure 4, Plate 2, spells grace and femininity, and yet remains dignified and conservative. This result was obtained by combining Figures 1 and 5, Plate 1. A heavy block letter or an old Roman letter would surely be out of place here.

While letterheads have been taken as an example, these suggestions may also be used in other ways. They can be applied to trademarks, business cards, labels, announcements, book covers, ciphers, monograms, bookplates, and in innumerable other ways.

MOTOR-DRIVEN VS. FOOT-DRIVEN PLATEN PRESSES

Frank P. Rich, Boston, Massachusetts

Eight years ago the writer was appointed instructor in printing in a school shop that had an 8 by 12-in. and a 10 by 15-in. C. & P. Gordon Press as part of its equipment. The 8 by 12-in. was a foot-driven press, while the 10 by 15-in. was operated by a motor.

I was informed that it was the custom to instruct the pupils on the foot-driven press first. I was told that it was an easier press to learn on for the reason that the pupil regulated his own speed and could make it go as fast or as slow as he wished, and then, it wasn't as dangerous as a motor-driven press.

This bit of information sounded quite logical and convincing, and so I started to teach platen-press feeding according to custom through the medium of a foot-driven press.

I was new in the teaching profession, but it did not take me long to discover that learning to feed a foot-driven platen press was a slow and tedious process for a beginner. I had a large class, and all were anxious to learn press feeding. With this state of affairs existing, I resolved to depart from the customary routine and give some of the boys a chance to learn on the motor-driven press.

This decision was not arrived at very quickly but I soon noticed that when the pupils practiced on the foot-driven press, they tired quickly. When they were fresh, the press would be operated at a

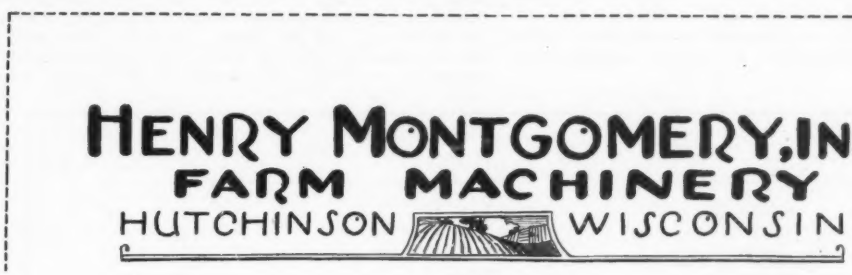


FIG. 1

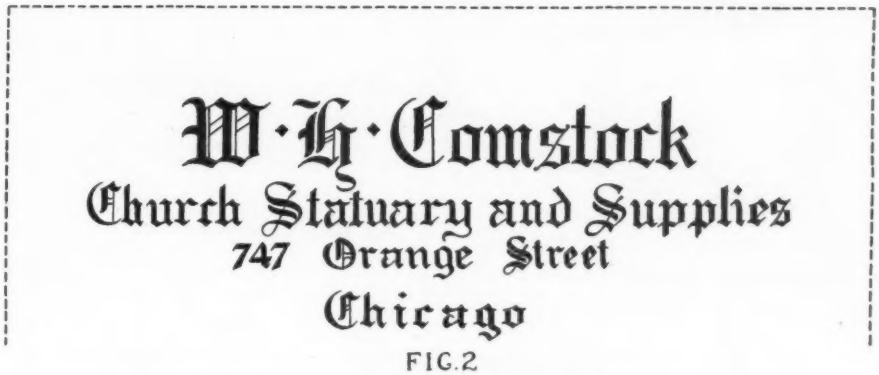


FIG. 2

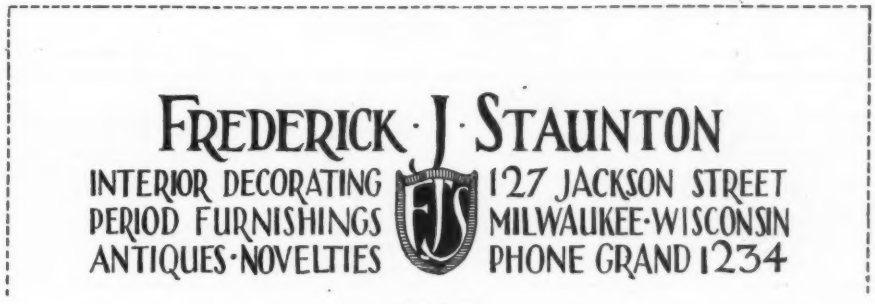


FIG. 3

FIG. 4

PLATE II.. SAMPLES OF LETTERHEADS, DESIGNED BY STUDENTS OF THE COMMERCIAL-ART CLASS, MILWAUKEE VOCATIONAL SCHOOL, MILWAUKEE, WIS.

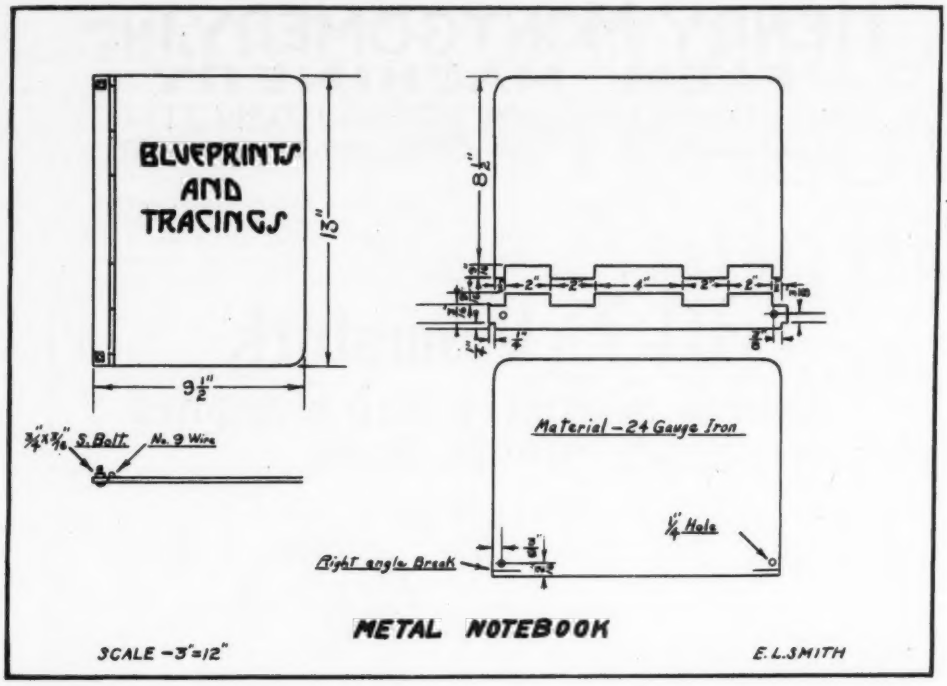
fast speed; when they tired, the speed of the press alternated and varied, and the feeding was off register. They would start the flywheel in one direction, and at the least let-up on the part of the pupil it would revolve in the reverse direction, necessitating a stopping of the press and starting over again.

The antics and futile attempts of some of the boys created a great deal of comedy, and in many instances was the cause of many of the more timid or self-conscious boys not wanting to practice press feeding.

METAL COVER FOR INDUSTRIAL-ARTS SUPPLEMENTS AND BLUE PRINTS

Erwin L. Smith, Waterloo, Iowa

After removing the tracing supplements from the INDUSTRIAL-ARTS MAGAZINE and making blue prints, no doubt many instructors have been confronted with the problem of providing a suitable holder for the tracings and blue prints. The metal book cover shown in the accompanying drawing has proved very satisfactory for this purpose as it enables the indexing of the tracings, protects them



while they are being used in the shop, and also allows for the removal of any tracing by simply loosening the two bolts slightly.

This type of cover may be used for any size tracings or blue prints by altering the size to correspond with the tracings to be placed in it.

Anyone having access to a few metal-working tools can construct the book cover in a short time.

The material used is 24-gauge galvanized or black iron. If galvanized iron is used, before applying any finish on the metal it should first be treated with a solution of vinegar or soda water to make the finish adhere to the metal.

Two or three coats of enamel or lacquer may then be applied and the cover may be lettered to designate the purpose for which it is to be used.

The first day on the motor-driven press, I noted that the press was a trifle too fast for beginners, even at its lowest speed. The press had a belt drive and by using a smaller driving pulley the speed of the press was brought down to 780 impressions per hour on its first speed. This speed I found was ideal for teaching purposes, and many of my pupils overcame their timidity, became confident, and were able to feed the press with a very good degree of accuracy after several trials.

Analyzing the results obtained from each type of press, it was apparent that the pupils learned to feed a motor-driven press easier and quicker than a foot-driven press, because they were able to concentrate their minds on their feeding, and they were not burdened by having to generate power by means of their feet. Feeding a power press means a coordination of mind, hands, and eyes, while a foot press requires the coordination of mind, hands, feet and eyes.

On a foot-driven press the pupil is constantly off balance, and he is forced to expend a great deal of energy to maintain his equilibrium. On a motor-driven press the pupil has both feet set firmly on the floor, he has perfect poise, and he is operating a press that is running at a steady rate of speed—a speed that has been determined beforehand. With a friction drive, press feeding is even easier as it is possible to run a press at a very slow rate of speed.

Another factor in favor of the motor-driven press was the "pep" displayed by the pupils when they returned to their classrooms to commence their academic studies. The difference was readily apparent and was repeatedly mentioned by the academic teacher. Instead of worn-out, tired boys, they were full of pep, smiling, and ready to tackle their problems.

Many instructors cling to the foot treadle because they believe it is much safer than a motor, and that the danger of accidents is minimized. However, isn't it a fact that the boys are eventually placed on motor-driven presses and not on presses operated by foot power?

It is the writer's contention then, that all platen presses in the school shop should be power driven. They should, however, be equipped with speed-changing devices wherewith the press can be operated at a speed sufficiently low to take care of the beginner.

DUSTPAN

Ray A. Gerke, Stevens Point High School,
Stevens Point, Wisconsin

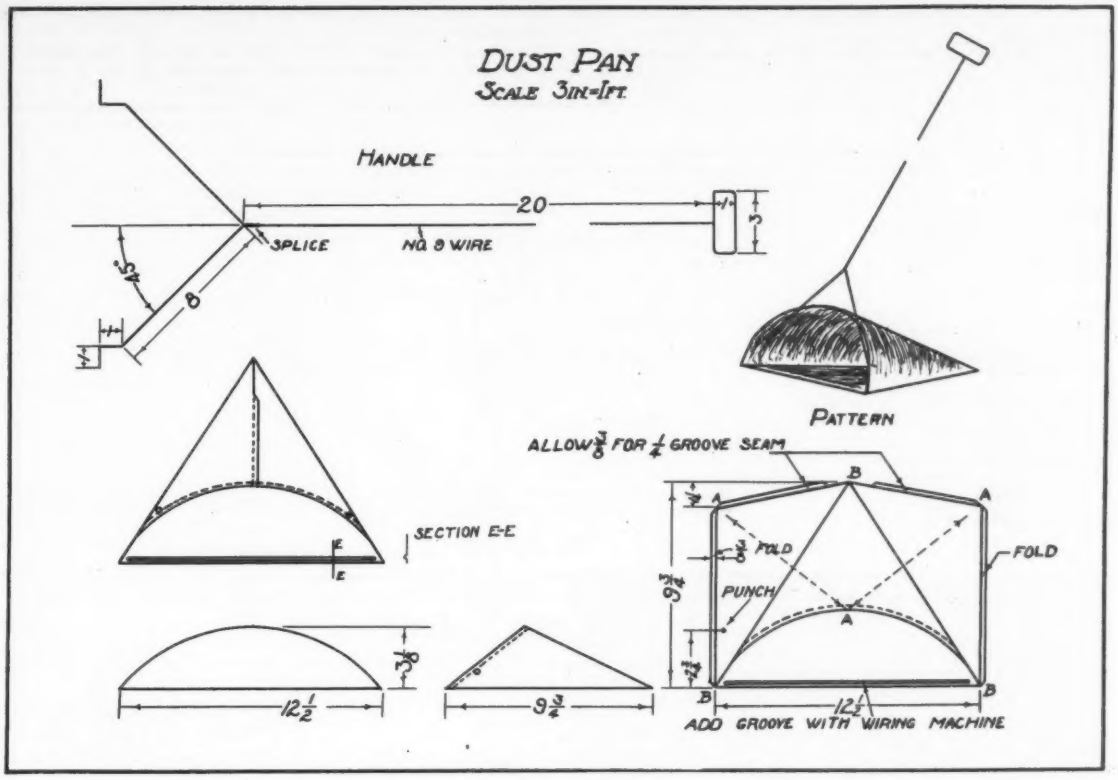
Like the taboret and footstool of woodworking fame, there have been many styles of dustpans in metal work. The one shown herewith has met with considerable success because of its unique, simple construction, and because it appeals to mothers for the reason that the bending necessary with the ordinary kind is eliminated. The project was used in the writer's classes in beginning metal work. It was made of either 24- or 26-gauge galvanized metal.

The steps in the procedure were as follows:

1. Obtain metal and cut to 9¾ by 13½ in.
2. Cut to the shape shown in the drawing, making the necessary allowances for seams and folds at the top and sides.
3. Punch ⅛-in. holes for the handle.
4. Add the stiffening groove at the bottom with the wiring machine.
5. Turn over folds at sides with bar folder set for ⅜-in. folds.
6. Bring corners A-A down and toward each other so as to make possible the hooking of the seam. Then, over a stake, lock the seam with a hand seamer.

Note: Do not attempt to make a sharp break at the sides along lines B-B shown in the pattern.

7. The handle must be made in two pieces.



a) Cut off 38 in. of No. 9 wire and bend to the shape shown.

b) For the second half of the forked portion cut off 10 in. allowing an additional inch for splicing.

Note: If trouble is encountered in getting the splice to hold rigidly, it may be soldered at the point indicated.

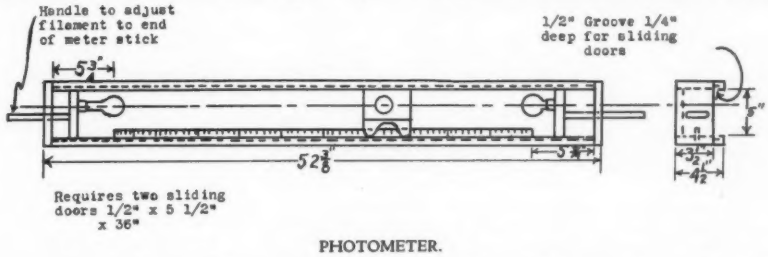
8. The handle is now ready to be inserted into the holes punched in the body at the outset. The dustpan is finished with a coat of black enamel.

A PHOTOMETER MADE IN THE SCHOOL SHOP

Geo. H. Whiteaker, Manual Training Instructor, Brush, Colorado

A good photometer is an essential piece of equipment for every high-school laboratory. The model shown here was built in the woodshop at a small fraction of the cost of a factory-made instrument and has been found to be every bit as effective. The fact that it was made by the students has only served to add interest to the photometer experiments.

The box was made of pine, but a better wood is to be recommended. The lamps are mounted on pieces which slide freely inside the box. The short handle is attached to this piece for the double purpose of keeping it perpendicular and of providing an easy way to move the lamp to a position where the filament is exactly above the end of the scale. The scale is a brass-bound, clearly marked meter stick glued into a groove ¼ in. deep. The instrument is completed by the little sliding unit containing the usual grease spot and mirrors and which may be obtained from a laboratory supply house. The entire job is stained black inside and finished as desired outside.


Handle to adjust filament to end of meter stick
1/2" Groove 1/4" deep for sliding doors
Requires two sliding doors 1/2" x 5 1/2" x 36"

PHOTOMETER.

In operation, the lamps are adjusted to come directly over the ends of the meter stick, the sliding doors are opened wide enough to permit manipulation of the sliding unit, and then brought up close to exclude all outside light before the final reading is taken. Note that the total length of the doors is considerably more than the over-all length of the box itself so that readings may be taken nearly to the end of the scale in either direction.

END TABLE

A. M. Mercker, Quincy High School, Quincy, Illinois

The one-post end table is especially desirable as a manual-training project because no duplication of parts is necessary. Also, by having a square section in the post for inlay designs, this project can be made to offer a real test in skill and accuracy.

Black walnut decorated with inlay designs of cherry and burr walnut on the post, and rosewood or cherry overlay designs on the base, is the most appropriate wood to use.

When introducing this project the instructor should have a working model before him. The students should then be supplied with blue prints and required to make a working drawing. Templates should be made for the top, base, inlay, and overlay designs.

Start by turning the post.

Band-saw the base pieces and make the lap joint. Sand the curves with a small drum sander made to fit the curves of the pieces. This is important in order to get all curves accurate.

Lay out the top with the template. Cut and shape the top.

Build up the border strips of selected burr walnut. These should be fastened to the top with glue and screws. Cut the back strip to length with 45-deg. mitered ends before fastening to the top. Then with square ends fasten on the two long side strips.

Then cut the front edge strip and the short side strips to fit and fasten to the top.

When drilling the holes in the base and top plate, great care must be taken to drill true. This may be done with a jig or a power machine carefully set up.

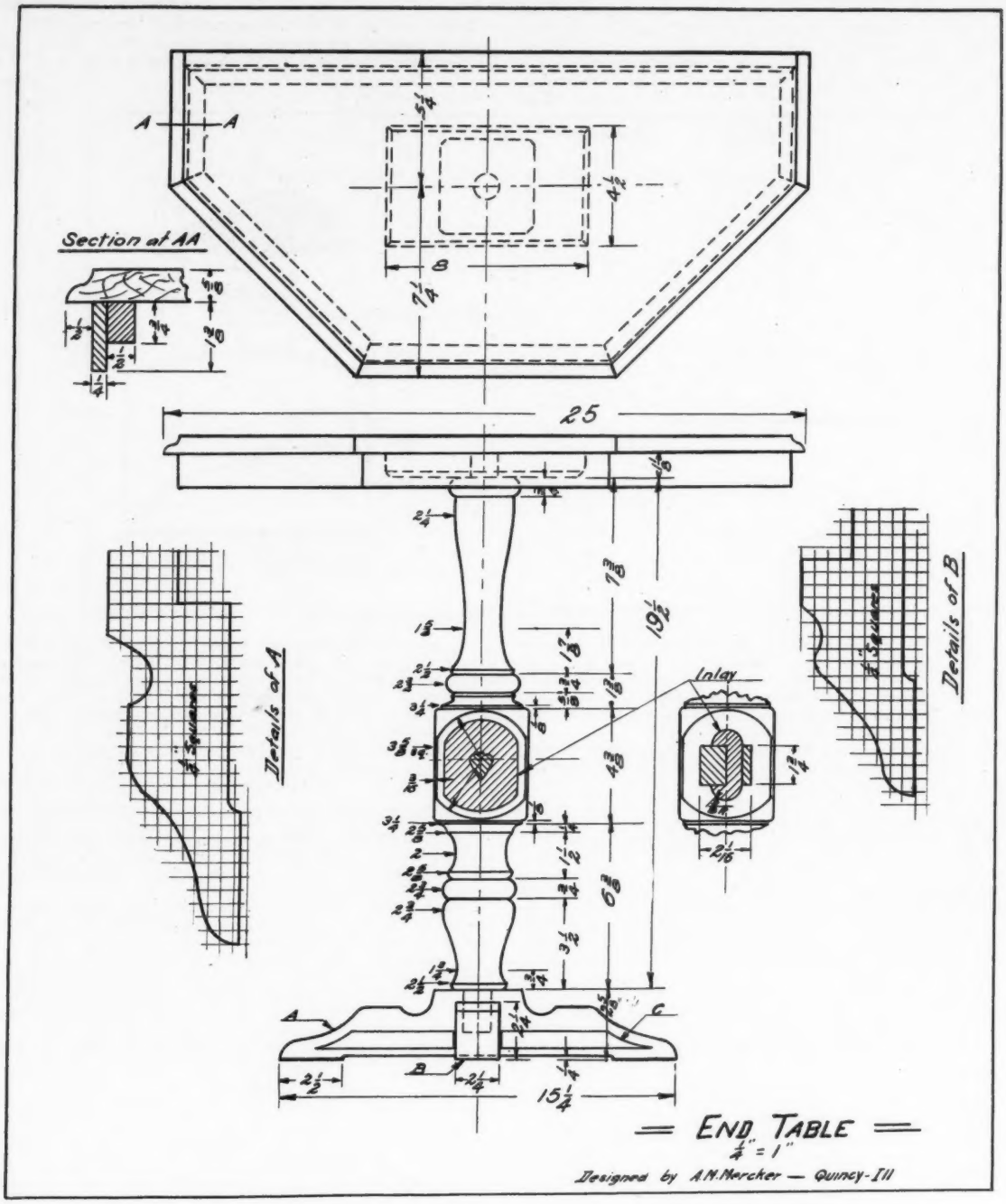
Next lay out and chisel out the post to receive the inlay. Cut the inlay pieces to fit and glue into place. This should be done piece by piece, allowing the glue to dry each time.

Great care should be exercised in selecting the stock for the inlay patterns so as to bring out a good color contrast between natural woods. The rosewood is glued to the base for an overlay design.

Glue top plate and base to the post, then fasten the top on with screws.

Sand well, then fill with walnut paste wood filler allowing each coat of filler sufficient time to dry. Rub off the filler thoroughly. To finish a rich dark walnut use a little linseed oil with the filler. Sand carefully with a 5/0 sandpaper before varnishing to bring out a clear natural walnut.

Apply two coats of varnish. Rub the first coat with pumice and oil and polish the second coat with rottenstone and oil.



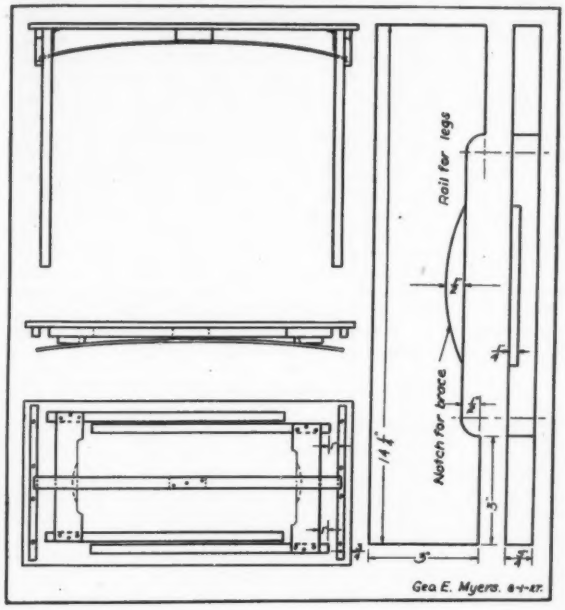
FOLDING TABLE

Geo. E. Myers, Everett, Washington

Although at first glance the construction of the folding table appears quite complicated, a more careful study of the drawing reveals that it is within the ability of the average seventh-grade boy. However, there are several operations which are fairly difficult, and enough care must be exercised in laying out and assembling the pieces to call for the student's best efforts.

If the legs are made of fir a fairly soft and close-grained piece of lumber should be chosen. Five-ply ⅛-in. fir panel stock is used for the top, as all of the strength of the table depends on this piece. A piece of ¾ by 6 by 14¼-in. stock is squared up for the rails.

The centers for the holes are located 3½ in. from each end, and the 1-in. holes are bored. Then the piece is ripped through the middle. If the notch for the brace is long enough it may be made in the middle of the rail. However, it must be remembered that the brace strikes off center. This notch may be cut on a circular saw or it will make an interesting job with a chisel. The brace should be of spruce or of some other springy piece of wood. It should not be cut to length until after it is screwed to the block.



Assemble the legs and the rails using the top cleats to locate the distance the legs extend beyond the crosspiece. Make sure the notch will be toward the center of the top. Screw and glue the top cleats and the brace block in place. To locate the hinges, the legs are placed in the folded position with the top ends against the top cleats and adjusted until there is plenty of clearance between them. After their position is marked, the legs are clamped in the open position and the screws set in the hinges. Drill and countersink for screws in the brace, spring it into position with one end in place and set the middle screw. If the brace is located properly, the other end may be cut and the remaining screws set. The brace may be lengthened by inserting a shim between it and the block.

Stock Bill

1 pc.	⅞ x 18 x 36	Top, plywood, five-ply.
2 pc.	¾ x 1 x 17	Top cleats, drilled for screws.
4 pc.	1 x 1 x 26	Legs, hinged to top.
2 pc.	See detail.	Rails, screw to legs.
1 pc.	¼ x 1¼ x 33¾	Brace, cut to fit, screw to block.
1 pc.	1¼ x 1¼ x 4	Brace block, glue to center of top.
2 pr.	2½ in.	Narrow steel butts.

FIRST YEAR MECHANICAL DRAWING MULTIPLE CHOICE TEST. TEST NO. 2

August Flam, Los Angeles, California

Directions: Underscore the word or words in each statement which make the best sense in the following statements.

1. In orthographic projection objects are represented by (1) a single view, (2) two or more views, (3) any number of views.
2. The top view of an object never gives (1) the height, (2) the length, (3) the width.
3. Slanting surfaces are (1) lengthened, (2) foreshortened, (3) unchanged, in the usual end view.
4. The auxiliary view shows the slanting surface, (1) distorted, (2) in its true shape and size, (3) elongated.
5. An angle is the (1) area, (2) opening, (3) distance, formed by the intersection of two lines.
6. A tangent is a line (1) that touches a circle at one point only, (2) that touches a circle at one or more points, (3) that does not touch the circle to which it is tangent.
7. The pitch of a screw is (1) its diameter, (2) the length of its threaded part, (3) the number of threads per inch of length.
8. A small threaded hole is called (1) a tap, (2) a ream, (3) countersink.
9. In developing a right circular cylinder there results (1) a square, (2) a rectangle, (3) a parallelogram.
10. In isometric projection measurements may be taken (1) on any horizontal lines, (2) on any vertical line, (3) on isometric lines.
11. In inking a pencil drawing the lines should be (1) heavy, (2) of the same grade of thickness, (3) some light, some heavy.
12. A full section is obtained when the cutting plane is assumed (1) to extend half way through the object, (2) to extend clear through the object, (3) not to cut through the object at all.
13. Both the exterior and interior of a symmetrical object may be shown on one view by means of a (1) half section, (2) full section, (3) partial section.
14. If a circle is parallel to a plane, its projection on that plane is (1) a straight line, (2) a circle, (3) an ellipse.
15. The form of screw threads generally used in this country is (1) the sharp V thread, (2) the Acme Standard thread, (3) the U. S. Standard thread.

GENERATOR- AND MAGNETO-TESTING STAND

Royal F. Jennings, South High School, Minneapolis, Minnesota

The generator- and magneto-testing stand shown in Figure 1 was made for use in a senior-high-school automotive electrical shop. It has been the writer's policy for years to teach electricity by the doing of actual repair jobs brought to the school by students and people in the neighborhood. Necessarily, these repair jobs require thorough testing before leaving the school. The test stand shown makes it possible to give any automobile generator or magneto a dependable running test.

FIG. 1. STUDENT-BUILT GENERATOR TEST STAND.

The main framework is an old square sloyd bench. Fastened to this in such a manner as to allow a rocking action, are two assemblies made principally from pipe fittings. Each of these assemblies is fitted with a V block in which to set the generator or magneto, and each has a long clamping screw at the top. Two countershafts mounted at the center of the bench are driven by a reversible motor set on the floor. By means of two sliding stepped pulleys on these tested. Two round belts are used, one on each stepped pulley. The belt tension is adjusted by rocking the entire pipe assembly to the desired position and locking it there.

The stepped pulleys give a sufficient range of speed to adjust most electrical units according to factory specifications.

A number of grooved pulleys were made in the school machine shop, giving an assortment fitting all popular makes of generators and magnetos such as: Delco, Autolite, Ford, Remy, Northeast, Bosch, etc.

In using the test stand, two 6-volt storage batteries are placed underneath on the floor. They are so connected that either 6- or

12-volt generators can be tested. This is made possible by means of a double-pole, double-throw knife switch on each side. (See Fig. 2.) Located on the same board with each of these switches is a reverse-current cut-out and an ammeter.

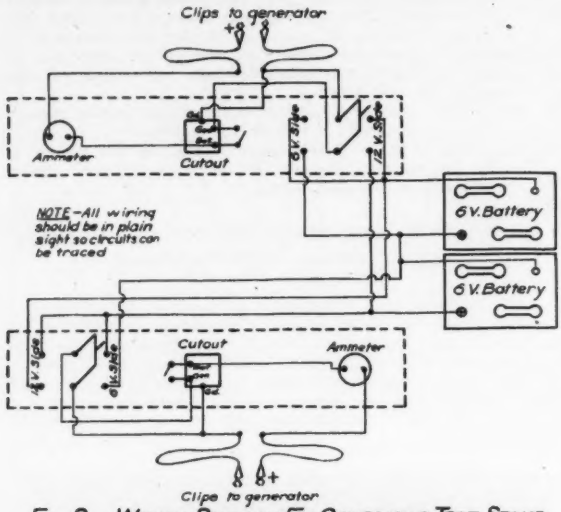


FIG. 2 WIRING DIAGRAM FOR GENERATOR TEST STAND

Although this test stand was made by students out of odds and ends at a trifling cost, it has been in constant use for two years, filling the requirements of a costly piece of equipment.

A HANGING WALL BOOKSHELF

Franklin H. Gottshall, Director Industrial Arts, Mount Berry School for Boys, Mount Berry, Georgia

Hanging wall bookshelves have become very popular of late years and the one here shown is very graceful and well proportioned. Its lines follow the spirit of early-American design, which is just beginning to come into its own.

All the curves on the scrolled sides are laid out with a compass, making this a good classroom problem not only in construction but also in laying out work of this type. All the scrollwork can be cut out with the coping saw, provided the saw is of the type that can be turned in the frame. Great care should be exercised, to smooth up the scrolled edge square with the side of the board at all points, and to have all corners and edges sharp, since very often work of this kind is spoiled by rounding corners in sanding.

All mortises are made as wide as the shelves are thick. This requires more care in fitting than would be the case if they were made narrower but it makes them stronger. It also requires more skill on the part of the student and therefore is a good attribute.

In designing this problem, one of the main objects was to have it strong and beautiful, and also large enough to hold quite a number of books, and at the same time conserve stock. It was therefore made without a back. There is, however, a suggestion given for a special treatment of the top, calling for a scrolled back above the top shelf. If this is added, it should drop below the top edge of the top shelf, but should not come below the bottom edge of it. It should be let into the sides as shown at A in the sketch, so that it will come flush with the back edges of the shelf and sides. When completed, the shelves can be fastened to the wall by means of brass mirror ears.

If the problem is made of oak or some other hardwood it can be stained and finished with an eggshell shellac finish. If made of pine or softwood I would suggest painting it. If more than one color is to be used I would suggest giving it several coats of, let us say, olive green and then giving the scrolled edge and front edge of the shelves a coat of darker green. Using two shades of one color in this way is always effective and will never be garish and cheap looking. Since this type of thing has become very popular and since books themselves are an interesting decoration for the home, it should make a very fine problem for the workshop.

A TEACHER'S POINTER

Russell E. Norris, Union-Endicott High School, Endicott, N. Y.

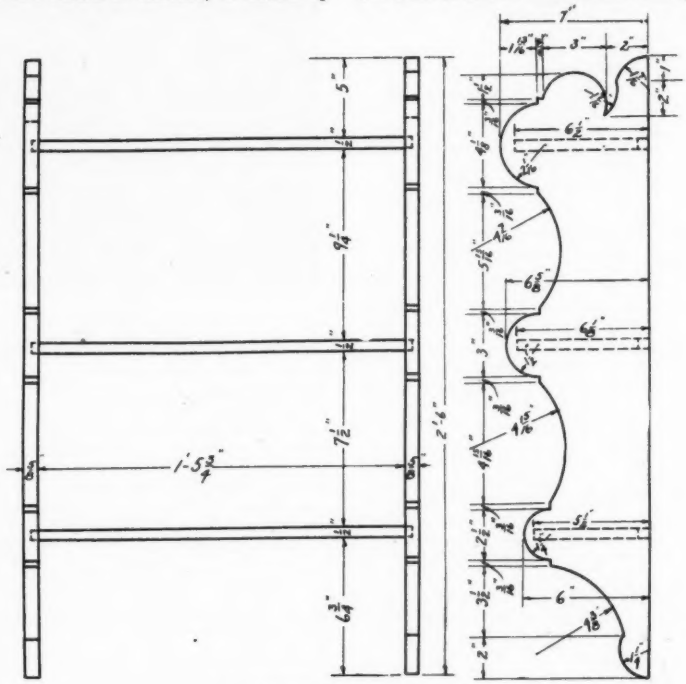
(See Supplement No. 87)

A pointer is a necessary part of the classroom equipment, but too often we find it either badly broken or missing. Perhaps the pointer that the teacher had was not strong enough or perhaps it had been called upon to perform a task for which it had not been designed. Be that as it may, the pointer herewith described is guaranteed to meet all requirements, and to last a lifetime.

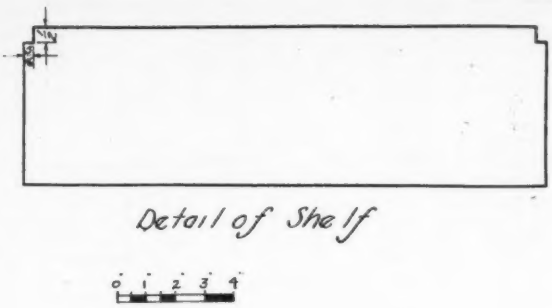
Pointers may be easily made by any industrial-arts class that has a band saw and a lathe as part of its equipment.

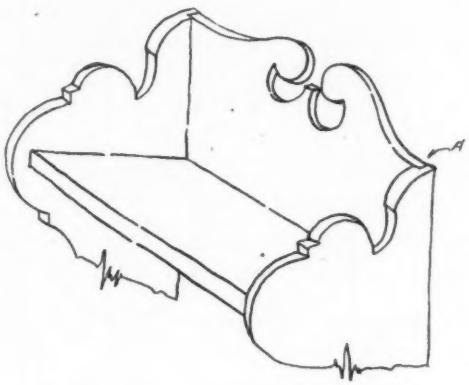
The jig shown in the drawing makes the task of ripping out the stock an easy one. This type of jig is applicable to many jobs where it is necessary to saw a number of tapered pieces such as wedges, stakes, etc.

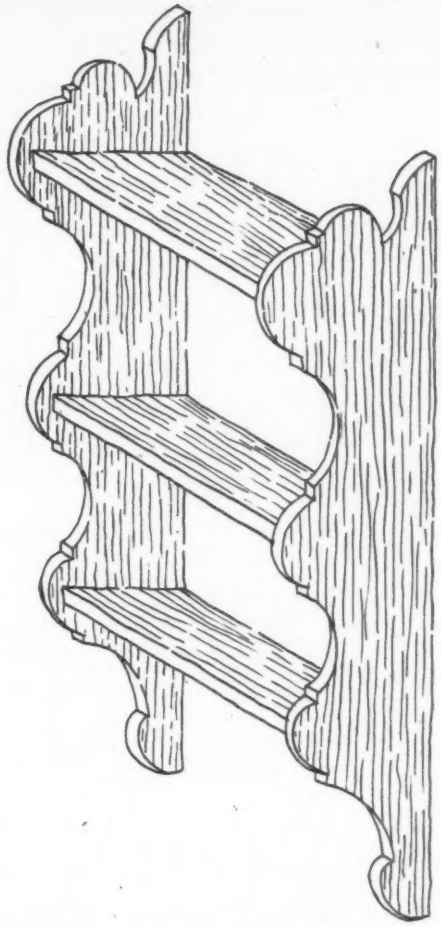
The stock should be cut to length, planed to thickness and the edges jointed true. After one strip is sawed off, the edge of the stock may be jointed again. You will then always have two planed surfaces on each strip. When one strip is sawed off, it is placed back in the jig with the former edge down and the taper sawed again. The stock should be reversed when sawing the next strip.



A HANGING WALL BOOKSHELF.







DETAILS OF HANGING BOOKSHELF.

The two sawed edges are then planed smooth with a hand plane. A circle should then be laid out on each end and the chamfers laid out on the sides. These chamfer lines are tapered, but by using the finger as a guide they may be gauged approximately with the pencil. When these chamfers are planed down tangent to the circles, the piece is octagonal in shape. Then the remaining corners are rounded off with a block plane.

The large end has two saw cuts made in it at right angles to each other and passing through the center. These grooves will allow the spur center of the lathe to grip the end firmly. It may be necessary to drill a small hole in the center so that the point of the spur center does not split the pointer. The small end is placed in the hollow center that has been made for the tailstock of the lathe. Rubbing a few flakes of paraffin in the hole will lubricate it sufficiently and keep the end of the pointer from burning.

When the pointer is mounted between centers, it should be steadied with one hand and the sandpaper held in the other.

Coarse sandpaper should be used first to work off the remaining corners. It should be finished with fine sandpaper until all marks of the coarse sandpaper have been removed.

The lathe should be run at a comparatively slow speed because if the pointers are very much out of true they are liable to fly from between the centers if run at a high speed. This will not happen if the speed is reduced and one hand used to steady the pointer while sanding.

After removing from the lathe $\frac{1}{16}$ in. or so should be sawed from the larger end to remove the marks of the spur center. This large end should then be made half round and a screw eyelet affixed.

Two coats of white shellac and a coat of varnish, and then rubbing with pumice and oil insures a fine finish.

The rubber pencil eraser should be shellacked and held in place with a small nail in the end.

The hollow center is made of maple and turned on the lathe. The dimensions for the taper may be taken from the regular center in the tailstock. When the taper has been turned it may be removed from between centers and be driven into the headstock in the same manner as the spur center and the hole for the pointer turned. This will insure a true center hole.

The jig is made of two ¾-in. pieces of stock. The shape of the pointer stock is cut from one piece and then the two pieces are screwed together. The edge of the pointer stock is placed in the jig and run between the fence and the saw, keeping the jig held firmly against the fence.

This job is a good one to give to the boy who is out of a job for a couple of periods. It is also a good production job for part-time and continuation-school classes.

WHAT TO DO WITH CASTAWAY CANS

C. M. Rice, North Junior High School, Everett, Washington

There are many tin cans thrown away every day that can be used in the manual-training shop. The sheet-metal instructor will find excellent materials in certain types for small projects. Canning factories throw aside many clean "test cans" that will be found useful in the school shop. This article, however, is devoted to a specific type used for vacuum-package tea and coffee. It is the desire of the author to bring recognition to these well-made containers which only too often find a lowly destiny on the city dump. The following projects are in one sense a continuation of the article published in the November, 1925, issue of the INDUSTRIAL-ARTS MAGAZINE under the title "Cumbak Toy."

Hobby Horse

Punch a hole in the center at each end of the can. A piece of wood may be tacked inside at each end to strengthen the tin. Bend the wire as pictured and force into a hole at the end of the stick.

Canisters

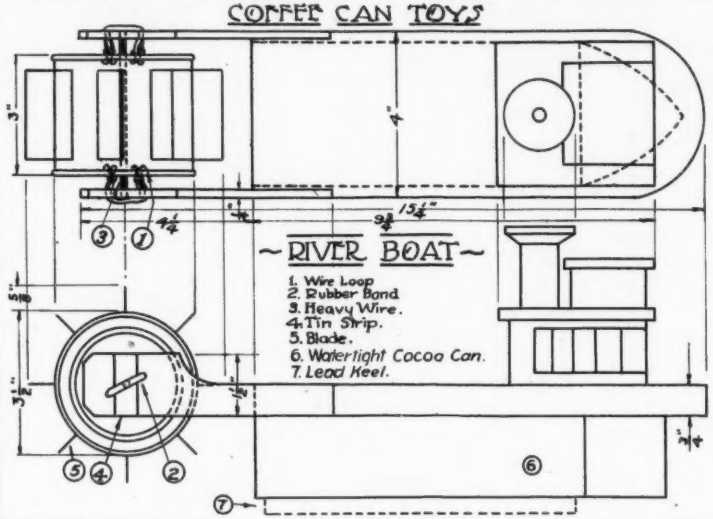
Select any number of coffee cans (vacuum-pack variety) ranging from 1-lb. size up. Punch a hole in the center of each top. Fasten a knob to the top of each with a bolt. Paint with white enamel and letter.

Steam Roller

Find a 1-lb. vacuum-pack coffee can. Use a jig for locating center at each end, and punch for axle (see *4*). Punch two holes in each end near center (see *1*). Build a frame similar to the one pictured, leaving plenty of space at each end of the can to permit the rubber band to wind up on the axle. The can revolves on a

COFFEE CAN TOYS

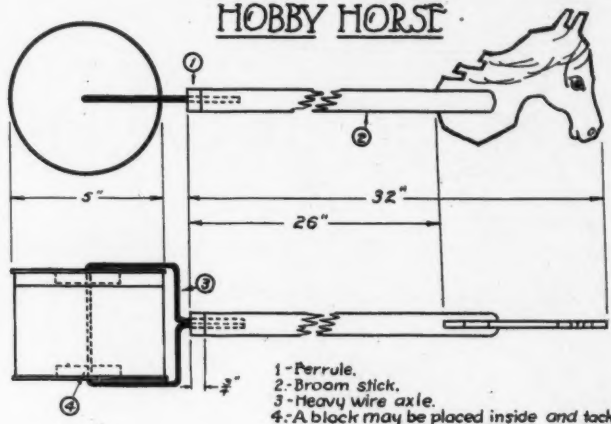
~RIVER BOAT~



1. Wire Loop
2. Rubber Band
3. Heavy Wire.
4. Tin Strip.
5. Blade.
6. Waterlight Cocoa Can.
7. Lead Keel.

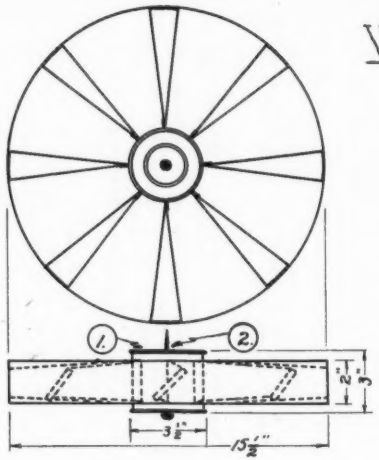
COFFEE CAN TOYS

HOBBY HORSE

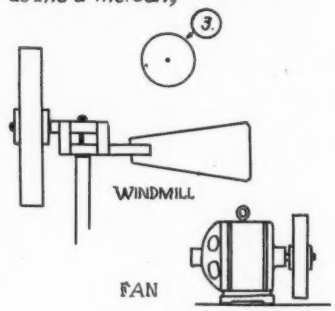


1 - Ferrule.
2 - Broom stick.
3 - Heavy wire axle.
4 - A block may be placed inside and tacked to reinforce each end where wire enters.

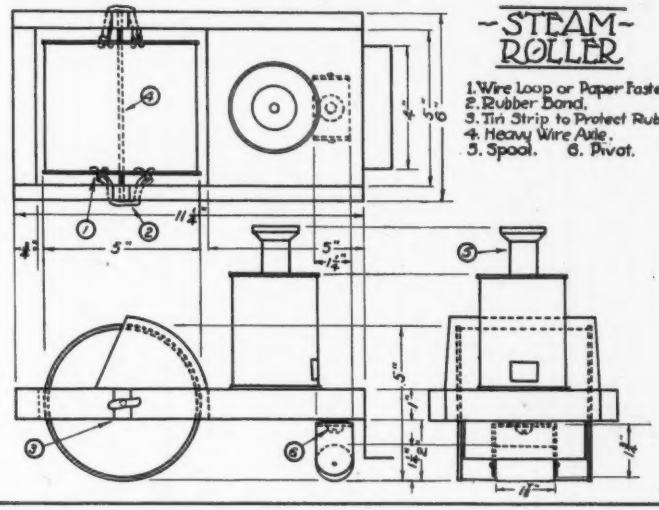
WINDMILL



1. Tin Can.
2. Pivot Reinforce with Tubing.
3. Jig for Centering. (Same Diameter as End of the Can.)



~STEAM~ ROLLER



1. Wire Loop or Paper Fastener.
2. Rubber Band.
3. Tin Strip to Protect Rubber.
4. Heavy Wire Axle.
5. Spool. 6. Pivot.

piece of heavy wire which passes through the wooden frame at *3*, and a piece of tin is used to hold it in place as well as to protect the rubber band at each end. Each rubber band is passed through two holes at *2* and fastened with wire loops at *1*. The holes through the wood should not have sharp corners and may be countersunk on the inside and outside of frame.

River Boat

Select a well-made can (a 4-oz. tea can with a press top was used in the design) and lay off spaces for the paddles on the outside. When the paddles have been marked out, a block or piece of lead should be cut to serve as an anvil and the blades *5* cut as indicated. Bend out and trim the edges. Punch a hole at each end for axle *3*, and two holes at each end for wire loops *1*. The rubber bands pass through two holes in each arm *2* and are fastened to the can at *1*. A piece of tin is bent around the arm to hold the axle in place and to protect the rubber. A 1-lb. water-tight cocoa can *6* is fastened beneath the deck and a lead keel *7* is soldered to the bottom at the center.

Water Wheel

Use a 4-oz. can. Punch a hole in the center at each end for the axle. Divide the outside surface into a number of equal parts (as for the wheel of the river boat). Scratch in the shape of each blade and cut with a wood chisel. Bend out and trim jagged edges. Use heavy wire for axle and solder at each end of the can. It is then ready to be placed beneath a water spout.

Windmill

The wheel of the windmill may be made in proportion to the size of the can selected for the hub. A 4-oz. tea can with a press top was used for the design. The outside of the can is divided into a number of equal parts and cut in such a manner as to form nibs when bent out. An equal number of blades are cut by a jig and soldered to the can. The outer end of each blade is soldered to a narrow piece of tin which has been spaced equally. The blades and this rim may be strengthened by beading the edges if desired. The can, or hub, may be reinforced by placing a wooden disc inside at each end or by running a piece of brass tubing through and soldering at each end. Decorate with colors.

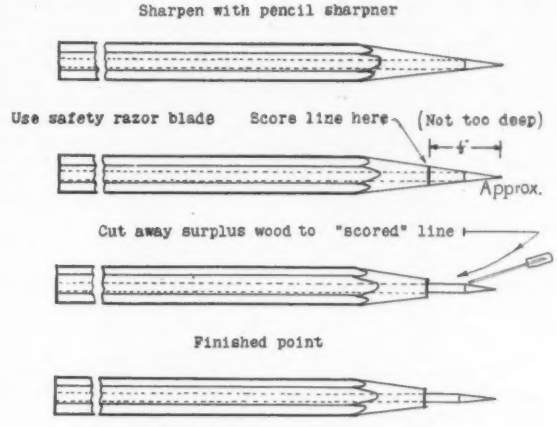
A NEW POINT

R. R. Bedker, Wauwatosa, Wisconsin

A very neat method to sharpen mechanical-drawing pencils in a semi-mechanical way was recently conceived by one of my students. The method has the following advantages:

1. The point is easily put on.
2. It remains sharp for a long while.
3. It is easy to "repoint" without resharpening.

The illustration shows how the point is produced.



DEVISED BY GEO. G. GREEN, DRAWN BY W. BEN HUNT.

THE NOVEMBER MEETING OF THE NEW YORK SCHOOL-CRAFTS CLUB

At the November meeting, Mr. Thomas Darling, the retiring president, gave a talk, in which he outlined a few suggestive future activities for the club. He urged that teachers get suggestions from industrial leaders and that they keep in touch with the outside industrial world; he asked that representatives of industrial plants be called on to give talks in the schools in order that pupils may be better informed on industrial employment; he urged that a committee be appointed to compile a list of the best and most useful books for a shop library both for teachers' and pupils' use; he suggested that ideas on courses of study be presented to the president of the club, together with suggestions for correlation with other subjects in the curriculum; he requested that the aims, purposes, and work of the club be brought to the attention of the industrial supervisors and that they be invited to attend the sessions of the club from time to time; he urged that the work and programs of the club be planned in such a manner that they will deepen a sense of responsibility on the part of the teacher, the pupil, and the community, and pointed out that the club may materially help the teacher member by offering those things which will go toward making the teacher most efficient in his chosen field of shop teaching.

At this meeting, seventeen names were presented and approved for membership.

At the business session, the following officers were elected for the year 1928:

President, Mr. Russell F. Hemion, Paterson, N. J.; vice-president, Mr. Arthur F. Hopper, Plainfield, N. J.; secretary, Mr. Julius Eisenstein, New York City; treasurer, Mr. Lloyd Stair, Madison, N. J.; financial secretary, Mr. L. O. Asher, Chatham, N. J.

Mr. Samuel Tannenbaum was elected chairman of the program committee; Mr. David Petrie of the membership committee; Mr. George H. Renneman of the entertainment committee, and Mr. Harry Fletcher of the publicity committee.

RUSSELL F. HEMION,
President of the New York School-Crafts Club.

MEETING OF THE NEW YORK SCHOOL-CRAFTS CLUB

The regular meeting of the School-Crafts Club of New York City was held on Saturday, January 21, 1928.

After the dinner, the meeting was given over to the program committee. Mr. I. Fixmaro of the Ambassador Sales Co., addressed the club on the topic "Radio as a Factor in Education Today." He stated that 70 per cent of the schools in North America were interested in radio.

The next speaker, Mr. Samuel Tannenbaum, gave a practical demonstration of the teaching of art metal work in the schools and playground centers.

Mr. Norman Crow, instructor in the Central High School of Paterson, N. J., gave a very interesting talk, illustrated with many samples of wood finishes.

These round-table talks are a regular feature of the School-Crafts Club of New York City, and Mr. Russell F. Hemion, newly elected president, is preparing a very interesting series of meetings for this year.—*Harry L. Fletcher.*

THE VOCATIONAL EDUCATION SOCIETY OF BOSTON

Annual Get-Together Meeting

The thirty-first annual get-together dinner and meeting of the Boston Vocational Education Society was held Saturday, January 14, at the new University Club. A social hour gave opportunity for the renewing of old acquaintances and the forming of new ones, before the party adjourned to the banquet room. Three of the seven charter members who organized the old Manual-Training Club in 1897 were present: Mr. John C. Brodhead, now assistant superintendent of Boston schools; Mr. Edward C. Emerson, associate director of manual arts, Boston; and Mr. James C. Clark, coordinator of the Hyde Park Cooperative High School. A total of 140 members and guests assembled for the meeting.

The dinner, enlivened by singing under the leadership of Mr. James C. Walker, preceded the business meeting and election of members. Twelve new names were added to the roster as follows:

Messrs. Atkinson, Boston; Backus, American Type Founders; Dewey, Somerville; Goderre, Everett; Kipp, Everett; Mackintosh, Brookline; MacNeill, Quincy; Morton, Dorchester; Olsen, Dorchester; Patrick, Beverly; Pinney, Medford; Roberts, Medford.

On motion of Mr. Morris, the secretary was instructed to send a letter to Mr. Clarence M. Hunt, director of manual training at Milton, whose poor health prevented his attendance. Robert E. Baker, a former president, also in poor health, sent his regrets at his inability to be present.

Professor Herbert Blair of Boston University, chairman of the Society's Committee on Education, made announcements concerning the meeting in Boston of the Department of Superintendence of the National Education Association. He urged attendance at the sessions as an opportunity for the members of the Boston society. Mr. Edward C. Emerson gave details of the sectional meetings planned for the same convention. Mr. Augustus Rose of Providence, R. I., spoke of the meeting of the Eastern Arts Association, which is to be held in Hartford, Conn., in April.

After a brief entertainment, President Ralph W. Babb introduced the speaker of the evening, Rev. Garfield Morgan, of Lynn, who took as his topic "The Art of Living Together."

"This art," said Mr. Morgan, "is the crowning achievement of humanity; an achievement not yet attained. If we inquire into life's values, into the meaning of existence, we find that the solidarity of human fellowship is a goal beyond material riches, efficiency, and scientific achievement. All these are of little worth if, having them, we cannot live in the happiness, peace, strength and dignity that make the highway of human interest."

The speaker referred to the idea, so prevalent during the latter half of the past century, of the law of strife, the survival of the fittest, as the basic law of existence. The year 1914, he maintained, was but the natural fruition of that false philosophy. Nine million men were buried as a sacrifice to a theory which has not yet been fully suppressed as a guiding principle in life.

Mr. Morgan spoke hopefully, however, of the present trend. In our own national life, he said, we are learning to avoid hate, and to substitute tolerance and cooperation. The field of industry presents today a far different aspect than only a few years ago, when it was virtually a great battlefield. The speaker illustrated the changed attitude by telling of a course conducted in the University of Chicago, where, after preliminary visits to some of the great industrial plants of that vicinity, the members of the group had the opportunity of sitting with heads of several of the greatest corporations and discussing with them the problems of industrial relationships, of the contacts of labor and capital and management. A sincere desire seems to pervade industry to cooperate for the mutual benefit of all concerned, instead of plotting for selfish advantage at the expense of others. The recent general strike in England nearly wrecked that country's industrial life before it impressed on all the same lesson which the war should have taught. The "make-or-break," "rule-or-ruin" policy no longer dares hold up its head in any civilized country. The "red menace" of which we hear so much, declared Mr. Morgan, is not to be feared one half as much as the menace of the intolerant man, be he employer or employee, whose guiding principle is a ruthless individualism.

The art of living together is quite as important in the field of education as anywhere. The tyranny of the schoolmaster is as much an anachronism as is any political tyranny. The dignity, the responsibility, the cooperation of the pupils are vital factors in that morale without which no school can be effective. Mr. Morgan, himself a member of the Lynn school committee, cited instances from his own observation and experience. Not much can be done in education without the realization that it is primarily a problem of learning the art of living together.

In religion today there is less emphasis on doctrine and denomination. Adherents of various creeds, without free compromise or sacrifice of convictions, are learning tolerance, and discarding that bigotry which questions the sincerity or the intelligence of all who may happen to hold to different doctrines.

In international relationships, the art of living together is making progress, though the millenium is not yet reached. A growing revolt against war and selfish policies which lead toward war, is making itself felt in every land. There is no citizen, however obscure, who cannot do his part in the creation of an attitude of international tolerance and sympathy; no citizen whose duty does not lie in that direction. Whenever we receive a letter through the mail, said Mr. Morgan, we can read into it a history of human civilization. One's given name on the envelope represents the first step; the individual, unique and self-centered. But following it comes the family name; indication of the banding together of individuals into a family, and the subordination of purely selfish motives to the good of this little group. The street address, with its number, reminds us that this family dwells in proximity to and in amity with other family groups on the same street. Then comes the name of the city; not merely a larger aggregation of persons and families, but a group which has learned to turn its tolerance and its cooperation into political channels, to work together on municipal undertakings for the benefit of all alike. Beyond the city is the state; a group of many cities and towns, with different local problems but with the wisdom to grasp the benefits of merging local interests in the general interest. It is this art of living together, applied to the country at large, which Abraham Lincoln vindicated in his life and his death. Why should not we of this generation carry the process one more step; carry it to the point where a family of nations, world wide, can exist just as our commonwealth of states exists in America?—*Frederick A. Coates.*

TORONTO SOCIETY OF ART TEACHERS HOLDS MEETING

The Toronto Society of Art Teachers was recently organized. Two meetings have been held and four more have been scheduled for the balance of the school year. The officers of the society are:

President, Mr. Edward H. Thomaw, Toronto; vice-president, Mr. G. A. Reid, Ontario College of Art; secretary, Mr. L. C. McKerracher, Jarvis Collegiate Institute; executive committee, Mr. T. W. Kidd of Riverdale, Miss Grace Coombs of Ontario, and Mr. Alfred Howell, of the Central Technical School.

The February meeting will be held at the Toronto Art Gallery on February 24, and the topic for discussion will be "What the Art Gallery Will Contribute to the Advancement of the Society."

The March meeting will be held on March 30. There will be a visit to the Studio Building and Mr. L. Harris will conduct a questionary on "the group of seven."

The April meeting will be held in connection with the Association of Manual-Arts Teachers, to be held during Easter week.

ONTARIO MANUAL-ARTS ASSOCIATION

The Ontario Manual-Arts Association, of Ontario, Canada, has announced that plans have been completed for the program of activities in connection with the convention to be held next Easter. The program committee has secured the services of Mr. Ralph G. Waring, of Syracuse, N. Y., who will present an interesting talk on the subject of "Wood Finishing." Mr. George Brigden, a member of the Toronto board of education, will discuss "Modern Methods of Reproduction." Other speakers will be Mr. H. H. Stansfield, of the Ontario College of Art; Mr. M. A. Sorsoleil, of the Ontario Training College, Hamilton; and Mr. S. W. Perry, of the College of Education, Toronto.

The committee has arranged for a repetition of the contest held last year, which had for its purpose the correlation of the departments of art and manual training. This year the committee will accept any project in which art and wood, or some other handwork, have been correlated. Prizes will be awarded to the successful contestants.

ST. PAUL TEACHERS' CLUB ATTAINS 17th BIRTHDAY

The manual-arts teachers' club of St. Paul, Minn., attained its 17th birthday on February 2. The club which was organized February 2, 1911, has never ceased to function and has never missed a meeting in its long period of service. Organized to promote the mental and social interests of the manual-training teachers, and to create a healthy desire for better methods of teaching, the club has increased its first membership of 12 to 52.

Of the charter members of the organization, eight are still serving as manual-training teachers in St. Paul and still are members. George M. Brace, now director of vocational work in the St. Paul schools, was the first president of the club, and L. H. Harnsberger, now instructor at the Central High School, was the first vice-president. The secretary-treasurer, J. I. Sowers, is now supervisor of industrial education at Miami, Fla. Mr. Brace was recently elected as honorary president of the club. Mr. Hans W. Schmidt, another charter member of the club, is now on the faculty of the state education department of Wisconsin. Lloyd M. Robbins and W. G. Keckler are not in the teaching profession.

The present officers of the club are: President, Mr. George H. Johnston; vice-president, Mr. Roy W. Wagner; secretary, Mr. Daniel Shirck.

THE AMERICAN VOCATIONAL ASSOCIATION AT LOS ANGELES

The second annual meeting of the American Vocational Association was a great success due to the untiring cooperation of many individuals and the wise selection of committee members and sectional leaders. The program was uniformly excellent. A high point was reached in the banquet program, which had as speakers representatives from Canada, Mexico, Hawaii, and the United States. The new sections on teacher training and industrial arts were well attended and met a real need. The conferences on printing education and apprenticeship and the special women's meeting each set goals for future conventions to reach.

The local arrangements for the convention eclipsed any meeting which the writer has attended. From the time the visitor descended

EDWIN A. LEE
RETIRING PRESIDENT OF THE A. V. A.

from the train, where he was met by an official welcomer, to the time when he said good-by, there was no effort spared to contribute to his pleasure and comfort. Everything was done promptly and efficiently and it was everywhere evident that months of planning had preceded the convention. Los Angeles has set a pace which Philadelphia will find it difficult to surpass. Pennsylvanians should begin now to make preparations for next December's meeting, even as Los Angeles did a year ago, if they would approach the excellence of the California convention.

So, here's to the third annual convention of the American Vocational Association at Philadelphia. We'll all be there and we'll go home from the east inspired to carry on to even greater heights the banner of vocational education. Meanwhile, the year is ahead of us with its problems and its rewards.—*Edwin A. Lee.*

FOURTH ANNUAL PLUMBING CONFERENCE AT PITTSBURGH

The fourth annual conference of plumbing and heating instructors was held January 9 to 20 at the Carnegie Institute of Technology, Pittsburgh, Pa. Nineteen men and one woman were in attendance, representing the states of Delaware, Maryland, New Jersey, New York, Pennsylvania, Ohio, Michigan, Illinois, Wisconsin, and the District of Columbia.

This conference is sponsored by the University of Pittsburgh, the Carnegie Institute of Technology, and the National Trade-Extension Bureau of the Plumbing and Heating Industries. The instructors during the course were Mr. S. Lewis Land, Dr. C. B. Connelley, Mr. Samuel E. Dibble, Dr. Walter B. Jones, Robert B. Leighou, Herbert L. Spencer, and Dr. Gerald D. Whitney. The special lecturers during the conference were Mr. C. B. Nash of the Standard Sanitary Mfg. Company; Mr. W. S. McDermott of the Alleghany Vocational School; Mr. James S. Hagan of Washington, D. C.; Mr. L. H. Dennis, director of vocational education in Pennsylvania; and Mr. John A. Quinn, chairman of the apprenticeship committee of the National Association of Master Plumbers.

At the close of the conference, a tentative plumbing-trade test prepared by Mr. S. E. Dibble, Mr. G. C. Donson, and Dr. W. B. Jones was presented for discussion and approval. The test attracted considerable attention and created a good deal of discussion. It is the purpose of the conference to eliminate all imperfections and present a revised standard test for the next conference.

NOW, ARE THERE ANY QUESTIONS?

Isinglass Glue

762. Q.: I would like to find out how to prepare isinglass glue to hold porcelain which has been frozen until it broke.—*T. J. M.*

A.: Isinglass Glue. Dissolve isinglass in water, and strain it through coarse linen. Then add a little alcohol, and evaporate to such a consistency that when cold it will be dry and hard. This will be found to be more tenacious than common glue, and therefore preferable in many cases.

Other porcelain cements may be made according to the following formulas: Fresh casein, 100 parts; triturate well with sufficient soluble glass to make a mass of the consistency of honey.

The foregoing two formulas were taken from the "Scientific American Cyclopedia of Formulas" by Hopkins, published by Munn & Co., New York City, N. Y.

Another formula for a cement for glass, or porcelain:

Casein, 10 parts; solution of water glass, 60 parts. The cement must be applied as quickly as possible and the cemented articles dried in the air. This is taken from the "Techno-Chemical Receipt Book," by Brannt and Wahl, published by Henry Carey Baird & Co., Inc., 116 Nassau Street, New York City, N. Y.

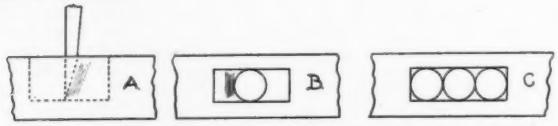
Cutting Mortises

763. Q.: In connection with teaching the cutting of mortises in grades 8 and 9,

a) Should the method shown at A in which only the old-time mortise chisel is used, be adopted in the school shop, or

b) Should a hole, the size of the mortise, be bored in the center, as shown at B, and the rest of the mortise cut with the mortising chisel, or

c) Should the entire mortise space be bored out as shown at C, and then the mortise finished with a straight ¼-in. or 1-in. chisel?—*J. H. K.*



A.: The third method is the standard, modern, hand method. It produces a better mortise in less time and with less fatigue than either of the others.

In view of the fact that it is occasionally necessary to cut a mortise for which the proper-size bit is not available, it is time well spent learning to cut a mortise with the chisel only. This method should be taught with the understanding that it is to be used in emergencies only. Great care must be taken not to split the wood when this method of cutting mortises is used.

Metal Designing

764. Q.: I am planning to introduce a course in metal designing, and I wonder if you have any material which I could use.—*J. W. G.*

A.: The following articles which appeared in the INDUSTRIAL-ARTS MAGAZINE may be of help to you in planning your course:

"Making of Steel Stamps for Marking Metal," Googerty, p. 188, Oct., 1914; "Sheet Metal as a Manual-Training Subject," Daugherty, p. 482, Nov., 1916; "Practical Articles Made from Sheet Metal," Cook, p. 458, Nov., 1917; "Course in Metal Work for High Schools," Berg, p. 227, June, 1919; "Ticket Box," Snyder, p. 163, April, 1920; "Varnish Can," Snyder, p. 205, May, 1920; "Junior-High-School Projects in Sheet-Metal Work," Derby, p. 61, Feb., 1921; "Bench Metal Work," Moore, p. 481, Dec., 1921; "Four Metalworking Problems," Moore, p. 202, May, 1922; "Two Simple Metal Problems—Bale Hook and Shoe Scraper," Moore, p. 325, Aug., 1922; "Milk Cooler," Moore, p. 452, Nov., 1922; "Milking Stool," Moore, p. 453, Nov., 1922; "Outside and Inside Calipers and Other Metal Projects," Berg, p. 495, Dec. 1922; "Sugar and Flour Scoop," Barnett, p. 80, Feb., 1923; "Sheet Metal for First-Year Trade Classes," Derby, p. 181, May, 1923; "Sheet and Art-Metal Work," Dexter, p. 236, June, 1923; "A Sugar Scoop," Tustison, p. 197, May, 1924; "Sheet and Art Metal Work in the Strong Jr. High School, Grand Rapids," Dexter, p. 243, June, 1924; "Metal Shop Project," Klaes, p. 73, Feb., 1925; "Revolving Doughnut Cutter," Jewson, p. xxx, June, 1925; "Match Box," Knupp, June, 1925; "Two Metal Work Problems," Campbell, p. 142, April, 1926; "General Metal Courses at Stout Institute," Bowman, p. 421, Dec., 1926; "Sheet Metal Nut Bowl," Bollinger, p. 453, Dec., 1926; "Sheet Metal and Art Metal Work," Dexter, p. 21, Jan., 1927; "Console Table, Mirror, and Candle Stick," Medary, p. 69, Feb., 1927; "Metal Work in Manual Arts," Manzer, p. 109, Mar., 1927; "Sheet Metal as a Trade-School Subject," Brandt, p. 121, April, 1927; "Shears Holder," Bates, p. 148, April, 1927; "Some Problems of the General Metal Shop," Bollinger, p. 161, May, 1927; "Some Problems of the General Metal Shop," Bollinger, p. 209, June, 1927; "Weather Vane of Wrought Iron," Greenleaf, p. 233, June, 1927; "Magazine Basket," Wieland, p. 425, Nov., 1927; "Writing-Desk Set," Bollinger, p. 468, Dec., 1927.

Boats

765. Q.: Kindly give me information and plans for motor-driven flat-bottom boats.—*J. S.*

A.: The following books on motor boats might help you in designing the type of boat you mention:

"Hand V-Bottom Motor Boat Designs," M. H. Hand, New Bedford, Mass.; "Book of the Motor Boat," Verrill. $1, D. Appleton & Co., 29-35 W. 32nd St., New York, N. Y.; "Design and Construction of Power Boats," Johnson. $3, Penton Publishing Co., 1213 W. 3rd St., Cleveland, Ohio; "Boat Building," Stephens. Published by Forest and Stream Publishing Co., 9 E. 40th St., New York, N. Y.

Industrial-Science Course

766. Q.: We have a course called cooperative industrial course in which the students during their last three years at high school alternate every two weeks between schoolroom instruction and actual shop practice in the different factories of our city.

We are interested in securing a text for use for the senior boys in this class. The text should be developed somewhat in the nature of a text in industrial chemistry and we are especially desirous of having as carefully treated as possible, the topic of metallurgy. —*C. F. V.*

A.: The following books may be of some assistance to you:

"Applied Science for Metalworkers," Dooley, The Ronald Press Company, New York, N. Y.; "Introductory Chemistry," Gordon, World Book Company, Chicago, Ill.; "Techno-Chemical Receipt Book," Brannt and Wahl, Henry Carey Baird & Co., Inc., 116 Nassau Street, New York, N. Y.; "Metal Workers' Handy-Book of Receipts and Processes," Brannt, Henry Carey Baird & Co., Inc., 116 Nassau Street, New York, N. Y.; "Machine Shop Science," Eaton and Free, The Manual Arts Press, Peoria, Ill.

Two articles on the subject appeared in the following back numbers of the INDUSTRIAL-ARTS MAGAZINE:

"Related Science for the Machine-Shop Smith-Hughes Class," Howes, p. 21, Jan., 1920; "Industrial Science in the Shops," Rowell, p. 178, May, 1925.

Minimum Requirements

767. Q.: In connection with work being done on the development of a course in industrial physics for the senior-high-school students taking the cooperative course, I am making an investigation into the minimum requirements for such a course. I am writing to inquire whether you can direct me to any information on the subject.—*E. F. O.*

A.: You may find some help in "Job Analysis and Curriculum Construction in the Metal Trades Industry," by Walter Benton Jones. Published by The Bureau of Publications, Teachers College, Columbia University, New York, N. Y.

PERSONAL NEWS NOTES

Mr. John J. Balfe of Cambridge, Mass., has been appointed an instructor at the Rindge Technical School.

Mr. Harvey Knoch has been added to the plumbing faculty of the Boys' Technical High School, Milwaukee, Wis.

Mr. Eugene Burns has been employed as an instructor in auto mechanics at the Boys' Technical High School, Milwaukee, succeeding Mr. Harry Paine, who has gone to Toledo.

Mr. Alois Hoffman has been appointed to fill the vacancy in the Boys' Technical High School staff, Milwaukee, Wis., caused by the death of Mr. Raymond Mahkorn.

Mr. Ewald Raasch, instructor in printing at the Boys' Technical High School, has been employed to teach various phases of printing at the Milwaukee Art Institute on Wednesday afternoons.

Mr. Earl M. Cass, assistant professor of vocational education at the University of Pittsburgh, Pittsburgh, Pa., has completed a special course leading to a master's degree. In preparation for the degree, Mr. Cass prepared a thesis on the subject, "An Investigation of Current Practices in Conducting Student Teaching in Selected Centers, Training Vocational and Industrial Teachers."

Dr. Gerald D. Whitney, head of the department of vocational education of the University of Pittsburgh, has been elected president of the vocational department of the Pennsylvania Education Association.

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In the electrical, as well as the woodworking shop the best materials and equipment are the cheapest to use. Manual training instructors have used Stanley Tools for many years because of their high quality.

Here are some of the Stanley Tools suitable for the electrical shop. As quality tools they should interest you.

Send for our two catalogs. No. 34 shows the complete line of Stanley Woodworking Tools. Catalog No. 25 shows the complete line of Stanley-Atha Metal-working Tools.

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STANLEY TOOLS

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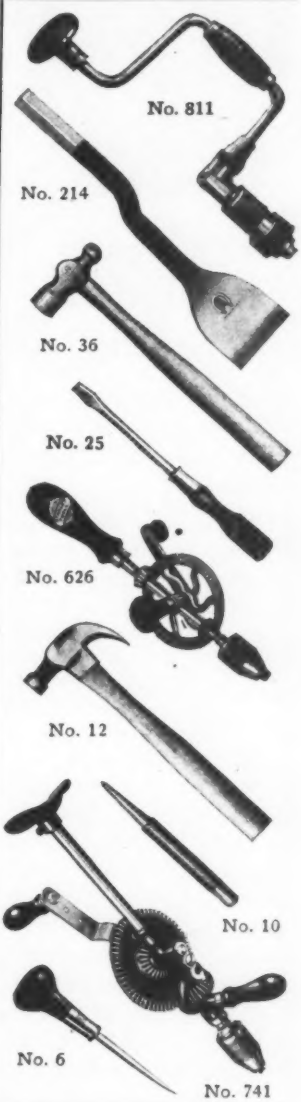

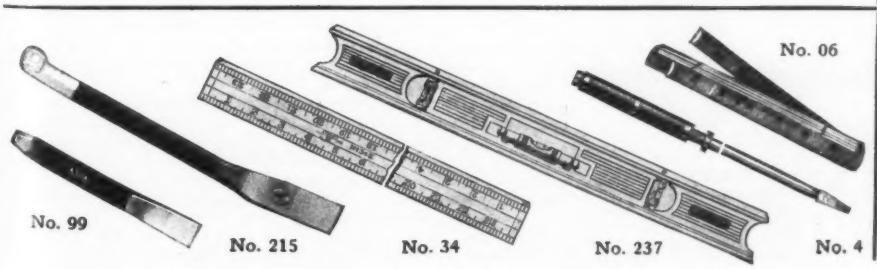

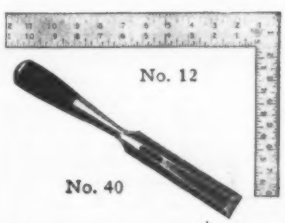

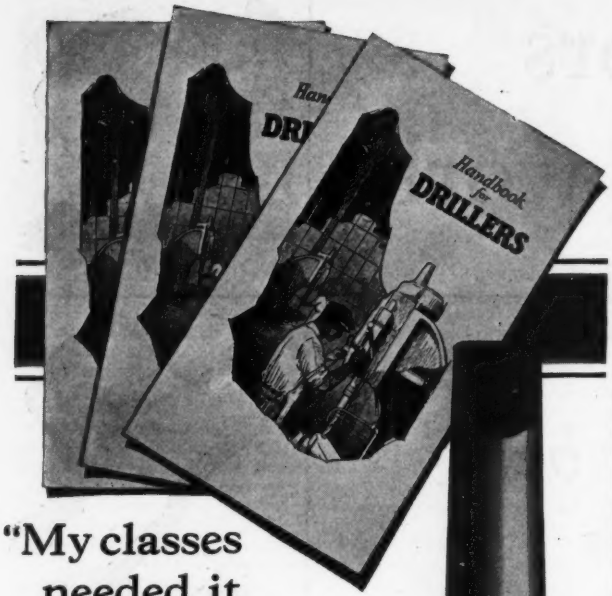

"My classes needed it badly"—

wrote an Eastern Instructor of Industrial Education, after receiving copies of the "HANDBOOK FOR DRILLERS."

"Not only does it contain the clearest and most concise description of the twist drill, how to grind it properly and how to use it intelligently, but its practical helps and hints make it an invaluable textbook for the student of machine shop practice."

The "HANDBOOK FOR DRILLERS" is written in a non-technical style, particularly for the use of students in High Schools, Vocational Schools, Technical Schools, Colleges, and by manufacturing establishments maintaining apprentice schools. It is printed in large quantities, and widely distributed by this Company, not as an advertisement to promote the sale of its products, but as its contribution to vocational education.

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NEWS AND NOTES

COOPERATIVE PLAN FOR VALLEJO, CALIFORNIA

The educators of the nation will be interested in a unique cooperative plan of vocational education, to be undertaken jointly by the Mare Island Apprentice School, the industries of the city of Vallejo, Calif., and the local board of education. The plan of education should prove of immense benefit to students who contemplate beginning their future employment in the local industries. Parents having boys attending the Vallejo public schools should find the courses outlined well worthy of thoughtful consideration.

The cooperative plan involves two closely related phases, each complete in itself. One of these phases consists of a special two-year vocational course of study to be administered in the Vallejo public schools; the second phase comprises the instruction to be offered in the shops and at the school during the normal navy-yard apprenticeship.

The special two-year course is offered to students during the ninth and tenth years in the Vallejo public schools. This course has been approved by the navy-yard authorities and is designed particularly to give a sound foundation in industrial subjects and to develop a knowledge of subjects in daily shopwork. Problems and ideas are approached from the viewpoint of the mechanic, rather than that of the more theoretical professional man. This course gives a foundation in English, shop mathematics, shop physics, industrial materials and methods, shop chemistry, mechanical drawing, history and civics. Such a course should prove of real value to any boy, whether or not he intends to enter apprenticeship. The course has been approved by the commandant and by the California state board of education.

The instruction offered to the navy-yard apprentices at Mare Island will be more comprehensive than in the past and all instruction must be acceptable for credits to the University of California or any other similar college. The state board furnishes instructors at the Mare Island Apprentice School to teach English, mathematics, and shop physics, while the navy yard furnishes instructors in mechanical drawing and trade subjects. The navy-yard school will continue and expand the work done previously in the Vallejo schools, carrying the subjects along more extensively than in the past. All apprentice shop counselors must qualify for state instructor's credentials, and the shop training becomes acceptable for credits in college entrance examinations.

Any boy who completes both parts of the plan of education outlined will be in an advantageous position as he will have:

a) A complete trade apprenticeship acceptable anywhere.

b) A diploma as a graduate of Vallejo High School.

c) Acceptable credits in subjects studied, should he desire to enter college.

As vacancies occur, apprentices will be called in accordance with civil-service requirements. Pupils who have completed the special two-year course in state schools will take the same entrance examinations as other candidates, but they will have considerable advantage over other candidates due to the previous study of industrial subjects.

Pupils taking the special two-year course in state schools are in no way bound to enter an apprenticeship, but should they do so they will be eligible for the rapid advancement now authorized in special cases by the civil-service regulations.

The industrial course as outlined above was made available in the Vallejo public schools beginning with the fall term, 1927; it will later be available in any state high school in which the special two-year "Mare Island Industrial Course" has been installed.

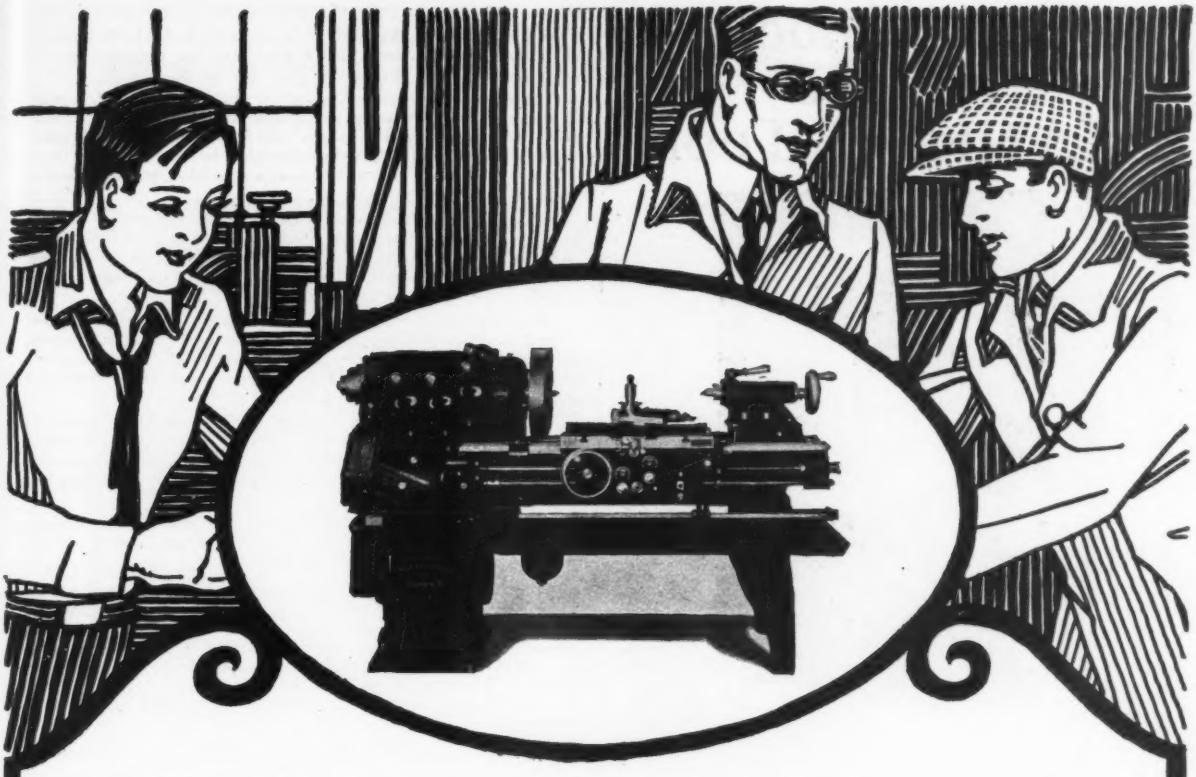
Cooperative Industrial Course at Rockford. A cooperative industrial course for high-school students has been introduced at Rockford, Ill. Under the plan, students electing the cooperative course must be 16 years of age and must have completed two years of high-school work. Owners of industrial plants must recommend the students, and the parent or guardian must give consent to the enrollment of the pupil in the course. Students who complete the two-year course will be given school diplomas and cooperative and apprentice diplomas. After the completion of the course, the students may enter college or may continue half-time employment in the shop for an additional two years. A total of ten factories are cooperating with the board in offering apprenticeship study to high-school students desiring to learn a trade.

Practical Cooperative Plan in Georgia School. Under a cooperative plan recently developed at the Georgia School of Technology, Atlanta, an alternate scheme of four weeks in school and four weeks in shops or engineering departments of Georgia railroads has been successfully carried out.

The plan contemplates work continuously by the same two alternating students for five years, at the end of which time each is to receive his degree in engineering. During the cooperative period, the students receive regular apprenticeship wages, with advancement or increase in wages dependent upon their value to the company and the length of time spent in the service of one company.

At present 86 students, 43 pairs of workers, are receiving mechanical and electrical training under the cooperative plan in the shops

(Continued on page 30a)



Train Your Students for Their Jobs — Use MONARCH LATHES

Train your students on MONARCH LATHES and when they go from your school they will be ready for their jobs —valuable men immediately without the necessity of going through another period of training in the shop.

The student that is trained on a Monarch Lathe is trained in actual shop practice — for the Monarch is the first choice of Industrial America. Today more Monarch Lathes are being sold to industrial plants than any other lathe built.

The Monarch motor-driven, helical geared Lathe is the ideal equipment for instructional purposes. It is far in advance of other lathes in design. It is as near danger-proof as any lathe can be made. It is as noiseless as any lathe can be—an important advantage in the instruction room.

Monarch Lathes are used in the Massachusetts Institute of Technology, Yale, Cornell, and in hundreds of the best technical and high schools — proof that the Monarch is the practical lathe for modern school equipment.

The success of your school and the success of your students are inseparably linked together. Use MONARCH LATHES and meet the modern demand for training that *fits men for their jobs.*

Illustration above shows 14 x 6 helical geared Monarch Lathe

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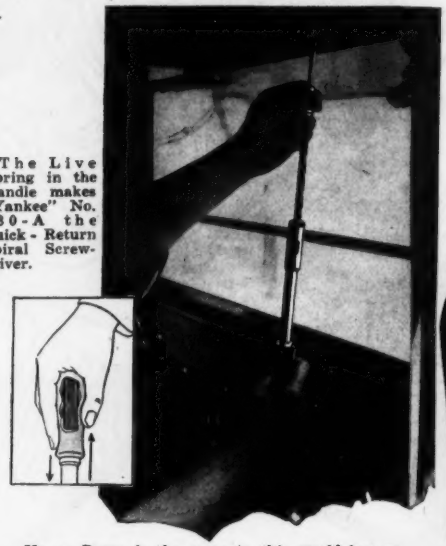
Good Schools deserve "YANKEE" Tools



The Live Spring in the Handle makes "Yankee" No. 130-A the Quick-Return Spiral Screw-driver.

No. 130-A Price $3.45

Up or Down is the same to this world-famous "Yankee" Spiral Screw-driver, No. 130-A. Just push! The spring in handle, with the "Yankee" Spiral, does the work for you—and saves your time.

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Drive screws the quick, easy way. Use "Yankee" Spiral Ratchet Screw-drivers.

"Yankee" No. 80-A, Medium Size — The World's Standard Spiral Ratchet Screw-driver. No. 31-A, Heavy Pattern. No. 35, Light Pattern. "Yankee" No. 130-A, No. 131-A, and No. 135 have Spring in Handle.

Besides Spiral movement all have right and left ratchet and rigid adjustments.

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"YANKEE" TOOLS

Make Better Mechanics

(Continued from page 28a)

of the Central Georgia Railroad. The Louisville & Nashville Railroad has 32 cooperative students, or 16 pairs, and the Southern has 12 students, or 6 pairs.

Industrial Apprentice Classes. A city-wide system of apprentice instruction is proposed in the schools at East Chicago, Ind. The system will be patterned after the plan of the international correspondence school and will be administered by the local vocational department. Students taking the course will be given practical training in the industrial plants of the city.

Establish Manual-Training Department. A manual-training department has been opened in the high school at Mansfield, Ohio. The purpose of the course is to teach the students the use of tools and woods, and to offer the fundamental principles of woodworking as applied to larger pieces of furniture.

Evening Vocational Classes at Neenah. The evening school at Neenah, Wis., is offering courses in patternmaking, cabinetmaking, and furniture construction for men, and sewing and art needlework for girls and women. A class in papermaking is being conducted under the direction of Mr. H. J. Noyes.

Vocational Classes in Textiles and Mechanics. Classes in loom fixing, designing, and textile calculation have been established in the adult night vocational school at Parker, S. C. Other courses being offered are machine-shop practice, mechanical drawing, carpentry, and architectural drawing.

New Vocational-Arts Building at Oswego. A vocational-arts building will be erected at the Oswego Normal School, Oswego, N. Y., at a cost of between $200,000 and $300,000.

Conduct Foreman-Training Courses at St. Louis. A class of 36 men were awarded diplomas on May 5, having completed the course in instructor-foreman training given by the University of Missouri. The exercises marked the closing of a fifteen-weeks course given at the McKinley High School, St. Louis, for foremen and superintendents in industrial plants. The class meetings took the form of conferences, with Mr. R. W. Hibbert and Mr. K. I. Gannon as conference leaders.

New Vocational School at Camden. Plans have been prepared for a vocational school at Camden, N. J. The building will cost $680,708. Messrs. Lackey and Hettle are the architects.

New Vocational System at Paterson. A new system of organization has been established at the vocational school in Paterson, N. J., which has had the effect of bringing the shops and academic department more closely together.

Under the new system, the teachers of academic subjects concentrate their efforts and teach their subjects to the various departments. For instance, one instructor has complete control of mathematics and science for the building trades, while another acts in a like capacity for the machine shop, the silk shop, and the pattern shop.

Architectural-Construction Class Inspects Buildings Under Construction. The architectural-construction class of Pratt Institute, Brooklyn, N. Y., visited the New York Life Insurance Building, which is now under course of erection. The trip was the first of a series of weekly trips to buildings under construction in the city.

Will Hold Farm Boys' and Girls' Club Camp. A national boys' and Girls' club camp will be held in Washington in June, 1928. This is an event of great importance to the future of agriculture and to the work of the department. Last year's club camp, which was the first to be held, provided an opportunity for country-wide discussion of the problems met in carrying on extension work in agriculture and home economics with boys and girls on the farm, and of ways by which the work may be extended to a larger proportion of the rural young people. The camp also afforded an opportunity to obtain first-hand information and contact with the organization of the federal government which might be passed on to fellow club members.

The 600,000 members of farm boys' and girls' clubs are engaged in carrying on practical demonstrations in better methods of farming and homemaking. Among the lines of club work are potato growing, cotton raising, food preparation and preservation, and home improvement. The 147 members from 38 states at last year's camp represented a total of $48,000 worth of property and equipment which had been accumulated through club work.

The program for the camp includes daily conferences for junior and adult campers. There are also addresses on matters of national interest by persons prominent in government affairs. Time is afforded for educational trips about the city, which enable the boys and girls to become acquainted with the organization and work of the government.

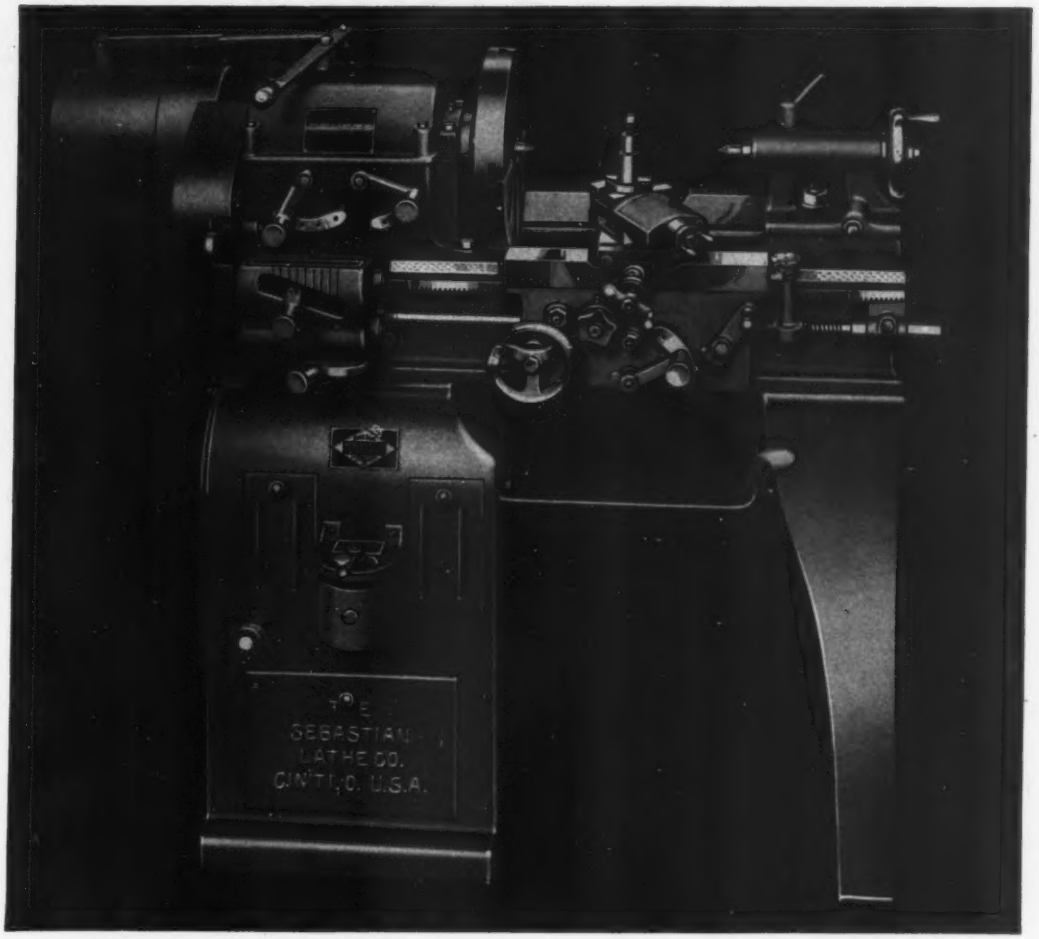
The officers elected for the ensuing year are:

President, Mr. Glenn D. Brown, Muncie; vice-president, Mr. Cornelius Abbott, LaPorte; secretary, Mr. Denman Kelley, Indianapolis.

(Continued on page 35a)

THE NEW 11-inch GOLD SEAL HEAVY DUTY LATHE

Reduces Breakage and Wear to a Minimum
Is as Precise as the Finest Tool Room Lathe



3-4-5-6 Foot Bed Lengths

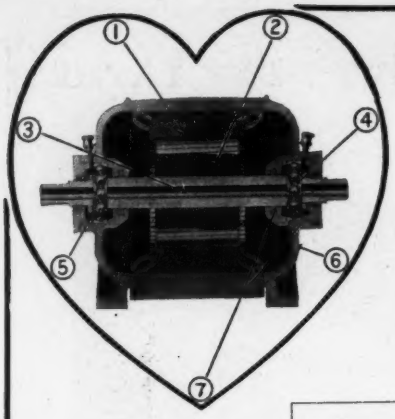
During recent demonstrations to school officials this new lathe was submitted to amazing overload and break down tests. It demonstrated beyond a doubt that a lathe particularly suited to school shop requirements is now available.

DETACH AND MAIL COUPON IN ORDER
TO ACQUAINT YOURSELF WITH COMPLETE DETAILS
OF THIS NEW LATHE.

The Sebastian Lathe Company
Cincinnati, Ohio

Coupon
The Sebastian Lathe Co., Cincinnati, Ohio.
Send descriptive Bulletin of your New 11-inch Lathe.

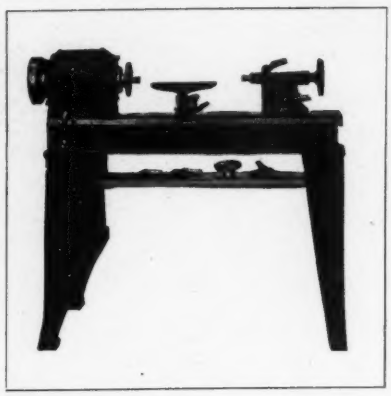
Name.....
Position.....
St. & No.....
City..... State.....
IAM-3



HEAVY DUTY BALL BEARINGS

At The Heart "Blount" Motor Headstock LATHES

1—Stator } 4-Speed
2—Rotor ∫ Squirrel Cage type—simple, positive, safe
3—Oversize Spindle, for added strength and load capacity
4—Heavy Duty Ball Bearings for greater load capacity, better lubrication, quieter running.
5—Independent Bearing Mountings.
6—Heavy Motor End Shields
7—Double Dust Protection



ASSURE:

Greater Load Capacity
Quieter Running
Less Vibration
Longer Life

No greater importance, from the standpoint of service, attaches to any part of a machine than its bearings. Herein lies its success or failure. Here is the superiority of Blount Motor Headstock Lathes.

The Extra Heavy Duty Deep Groove Type Ball Bearings in the Blount Motor Headstock are a distinct departure from customary design and assures users of quiet, vibrationless operation with increased years of satisfactory service.

Write for information and bulletin

J. G. BLOUNT CO.
EVERETT MASS.

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

NEW TYPE B LATHE

The Lux Machine Company of Minneapolis, Minn., has announced a new type of B lathe, of the nonportable type, which is designed to handle the work which is beyond the scope of the three-speed portable lathe.

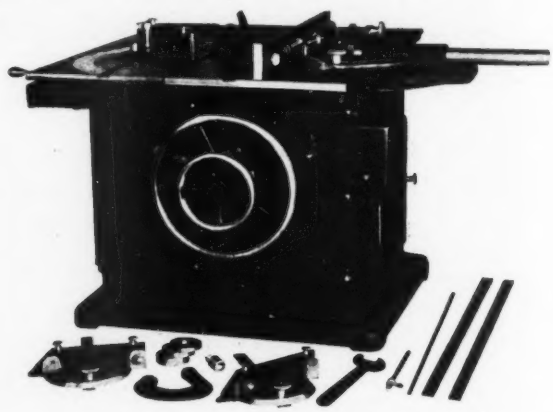
The type B lathe is distinctly different from any other lathe on the market and is designed to fit the particular requirements demanded. A high-grade push button has been provided as a protection to the operator and large pieces can be turned with the aid of an outside faceplate. The bed of the lathe is cast in one piece and is machined accurately to permit ease of operation and to give strength and rigidity.

The lathe is furnished with motor, push-button starter, two drive belts, one spur center, one cup center, one faceplate, one cone center, one screw chuck, and one toolrest.

Information concerning the new type B lathe may be obtained by writing to the Lux Machine Company at 22 East Hennepin Ave., Minneapolis, Minn.

NEW OLIVER SAW BENCH

The Oliver Machinery Company of Grand Rapids, Mich., has announced a new type of saw bench for use where the work is placed upon a stationary table and for angle sawing. Some new principles in design have been devised which make the machine convenient in operation and upkeep and very helpful to the operator.



The machine is furnished with plain table and gauge, or with universal sliding table and ripping fence. It is provided with push-button control, a large handwheel for tilting the saw, a small handwheel for raising and lowering the saw, a lever for locking to any position, a sawdust chute for connecting to the exhaust system, and a ball-bearing motor head lubricated by the Alemite system. The machine may be fitted with a 14-in. or larger saw as desired. On 60 cycles, the saw operates at 3600 r.p.m., on low speed, or 4500 r.p.m. full low speed. The machine comes complete and wired, ready for use.

(Continued from page 30a)

A TOY ANIMAL EXHIBIT AT LINCOLN, NEBRASKA

The photograph shows a collection of 130 toy animals made by fifteen boys in the woodworking classes of the industrial-arts department at Lincoln, Nebr. The toys were made from scrap lumber and boxes during spare time, and include ducks, terriers, bulldogs, and bear jumping jacks. All of the toys were finished in bright colors. The boys also repaired and finished a number of broken toys which had been gathered from various homes in the city.

TOYS MADE IN WOODWORK SHOP, LINCOLN HIGH SCHOOL, LINCOLN, NEBRASKA

The toys were on display for a limited time and were then turned over to the Salvation Army and the Family Welfare Society for distribution among the poor children of the city.

The work was performed under the direction of Mr. J. A. Hoskins, director of woodworking and carpentry in the Lincoln industrial-arts department.

Vocational Directors of Indiana Organize. The Vocational Directors' Association of Indiana is the name of a new organization composed of directors, supervisors, and teacher trainers in the industrial field. One of the projects undertaken is the publication of a vocational news letter, which is being printed in various school shops. Each city having a school shop takes its turn at printing one issue and telling something of the work of the local department.

Announce Second Model Aircraft Tournament for 1928. Announcement has been made that a second national playground-model aircraft tournament will be held in 1928. The first tournament was held in 1927, under the chairmanship of Orville Wright and Colonel Charles A. Lindbergh. The tournaments were held in 100 cities, with 20,000 boys and girls working on model aircraft. Of the total who entered the contest, 53 were qualified and 30 were present as candidates for the final contest held in October at Memphis, Tenn.

The boys ranged from 12 to 20 years and the models included sea and land planes, scientific and commercial planes, pushers and tractors, single and double propellers. The workmanship was excellent and the planes gave evidence of the tremendous amount of thought and effort expended on constructive play activity. Both the senior and junior championships were won by Chicago boys, although twelve cities were represented among the point winners.

This year's tournament will be even more interesting. Communications are constantly being received asking for information on the building and flying of model aircraft. One city, Los Angeles, reports that a twenty-acre tract of land has been set aside by the recreation department as an airport for model planes. The Playground and Recreation Association of America has announced the early publication of a book on model aeronautics embodying last year's experience in model aircraft building and flying.

The model aircraft tournament is being conducted by the Playground and Recreation Association of America and is sponsored by a special committee of eleven experts in commercial aircraft, headed by Orville Wright, chairman.

Mr. Leon J. Carr has been elected chairman for the next year.

Enrollment Increases in Nebraska Schools of Agriculture. The Federal Board for Vocational Education, in a recent communication reports that a total income of $44,243 has been realized by pupils in the vocational agricultural schools of Nebraska from super-

(Continued on page 36a)

start him *with the* right tools

Selection of proper tools for manual training pupils is just as important as the selection of proper text books.

Genuine Irwin Auger Bits have earned the right to your confidence. They have proved to thousands that they cut cleaner, truer, faster, and last longer. Their unvarying uniformity is of extreme importance. The next one will be just as good as the last.

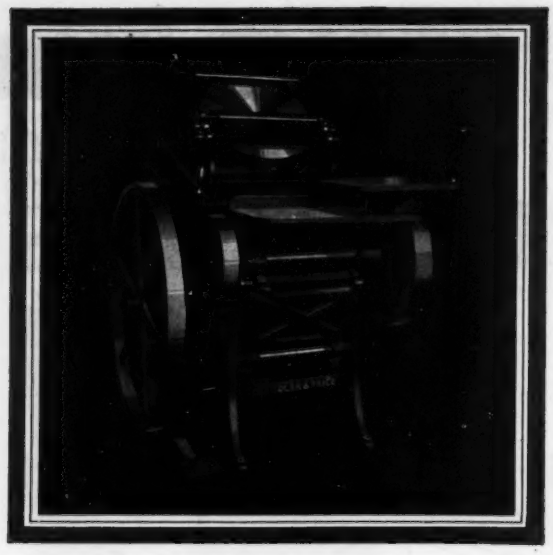
There is a special 13 Bit set for Manual Training use. It includes a full range of sizes, each cutting head designed and timed for best results under Manual Training School use. Write for information on this set.

We will also be glad to send our book "How to Select, Use, and Care For Bits."

Most all good hardware dealers handle Irwin Auger Bits.

THE IRWIN AUGER BIT CO.
Wilmington, Ohio.

IRWIN *Auger Bits*



C & P Presses . . .
The Ideal Investment

IN Cleveland's 26 high school printing departments, 49 Chandler & Price Presses are doing an indispensable, thorough job of educating the next generation in artistic appreciation. And the number is growing constantly.

Cleveland school supervisors declare that C & P Presses have turned in a perfect record for attendance and conduct. One instructor points to a "C & P" upon which not one cent has been expended for legitimate repairs in 12 years. This case is typical.

"We use nothing else," says one official. "Their first cost is reasonable. They cost very little to maintain. Our exhibits are gratifying. Their long life, negligible upkeep, and pleasing results make C & P Presses supreme in our field."

Probably no other investment that can be made in school equipment yields equal returns in terms of long, trouble-free service. May we discuss your present requirements?

Chandler & Price
PRESSES & PAPER CUTTERS

THE CHANDLER & PRICE COMPANY
Cleveland, Ohio, U. S. A.

(Continued from page 35a)

vised farmwork during the year. Farm boys in 52 communities were given the opportunity to earn while they learn.

Dr. C. H. Lane, state supervisor of agriculture, reports that during the past two years, the enrollment in schools offering vocational agriculture has increased 100 per cent, the number of vocational departments in high schools 37 per cent, and the number of schools offering evening work for adult farmers has increased 50 per cent.

The last survey of Nebraska showed that 71 per cent of the boys who completed one or more years of work in vocational agriculture and who are out of school are farming. It may, therefore, be concluded that farm boys are enrolling in these courses, and after completing them, enter upon the work of the farm. Schools and enrollments have greatly increased, the increase in enrollment coming mainly from nonresident farm boys.

It is brought out that one of the big problems before those responsible for the expansion of the agricultural program is to secure competent teachers who are available during the dull season when persons out of school may participate in instruction looking to the improvement of their business as farmers. One source of supply of prospective teachers is farmers who have been specially trained at the state agricultural college. In some cases the farmwork during the winter is such that these men are able to be away from home for a few weeks.

Part-time work for those not established in farming, and evening work for adults are often organized in communities where these men live. A source that provides teachers, is specialized agricultural work, where the business does not require the full time of the worker during the entire year. These come from hatcheries, dairies, orchards, poultry farms, and commercial gardens. They prove to be valuable teachers in their highly specialized work.

It is emphasized that the mere gaining of information on agriculture in school does not make a farmer. A boy must become a practical farmer at school, if he is to take full advantage of his school instruction in agriculture. The school instruction is taken in connection with a farm enterprise at home as a required part of the course. For example, the income last year from sow-and-litter home projects was $17,446, corn projects $4,922, dairy-production projects $2,913, egg-production $2,190, potato-production $1,438, and wheat-production $2,239, making a total of $44,243 from all forms of home-supervised farmwork.

Part-Time Shop and School Plan. The plan of part-time school and shop employment was first put into practice in 1906 at Cincinnati. Today there are many industrial centers where the part-time system is employed. Associate Supt. Frank M. Leavitt of Pittsburgh reports that "in Pittsburgh, every indentured apprentice goes to school one day a week on the employer's time. The electrical-workers' union asked for a class in the evening school. From 600 to 900 apprentices in several trades attend evening school under compulsion of the unions. Foundry men have asked for apprentices. They try to get boys for half time and cannot. We must get them, and the employers take them on."

Charles F. Bauder, director of industrial arts, Philadelphia, says: "We have demonstrated to employers in plastering, printing, metal trades, paperhanging, and painting that it pays to return boys to school for one-half day a week for training under pay. Most of them come on Saturday morning. All are over 16 years of age. One half of the time in school is devoted to academic work related to the trades. In metal trades, all is academic. We now have 85 boys in metal trades and 75 in plastering. Boys of the last year's week-about cooperative trade-tailoring course obtained jobs largely on full time. A new two-year course is being organized. A new vocational school now being planned will offer fine opportunities for part-time courses especially with textile apprentices. A committee of the textile-manufacturers' association has recommended a week-about plan in place of the present eight-hour week in school."

An employer in Pennsylvania says: "With the new system of cooperating with the schools, in three years we have trained 4 machinists, 2 sheet-metal apprentices, and 2 patternmakers. In the next twelve years, we will have trained 40 machinists and 25 sheet-metal workers, instead of 14 and 6, as formerly. Trade training should lead to professional training. Many workmen have job or position training only—neither good vocational equipment nor training for enjoyment of life. The difficulty is that the trades are becoming so complicated that they are over the heads of the workers."

Job Sheets in Homemaking Education. A series of job sheets were prepared jointly by the Michigan teachers at the part-time school conferences handled by Miss Freegard. Under the plan, teachers in the various cities sent in copies of the job sheets they had prepared. A committee selected the sheets which seemed most useful and these were later mimeographed and distributed by the Michigan State Department.

(Continued on page 38a)

EDUCATION *and* PRINTING *are twins, progressing together, and jointly uniting to make for better citizenship and the enjoyment of life*

A Master Craftsman

BENJAMIN FRANKLIN, *printer, idealist, statesman, inventor, patriot and educator, secured his education through* PRINTING

NO other industrial arts subject is so well fitted to be included in education, whose objective is cultural, as is Printing. Invented at a time when illiteracy was general and education was confined to a favored few, Printing has been and is now the tool by which knowledge and information are extended, by means of books and newspapers and magazines, to the masses.

Printing is also one of the leading vocational subjects in the schools. The work of the printer is mentally stimulating and offers unlimited opportunity for advancement. Rated third in economic importance among the industries of the country, printing offers attractive careers in many lines—typographic, mechanical, artistic, or business.

Printing is the one industrial subject that is suitable for *any type of school.* Its installation requirements are few and the initial and maintenance costs are less than for most industrial subjects, yet its educational benefits are greater.

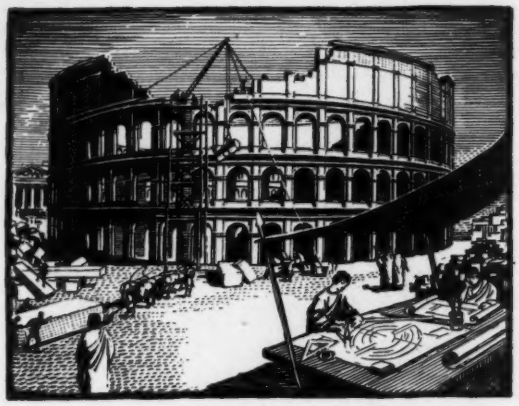
As a modern educator you are probably considering the installation of a printing equipment. Write today for information regarding suitable printing outfits for schools.

F. K. PHILLIPS, *Manager*, EDUCATION DEPARTMENT

American Type Founders Company

THREE HUNDRED COMMUNIPAW AVENUE

JERSEY CITY, N. J.



WHAT MADE THE COLOSSEUM COLOSSAL?

Not only its immensity, but the fact that it was *planned,* by repetition of columns and arches, to *appear* even *larger* than it was. Primitive instruments were used in the planning, but with majestic results. The work of these ancient draftsmen would have been materially lightened if they could have used

K&E

DRAWING INSTRUMENTS

ANVIL BRAND

Their moderate price keeps well within the modest budget of students, yet these instruments will perform side by side with their more expensive brothers, and suffer nothing by comparison.

KEUFFEL & ESSER CO.

New York, 127 Fulton St. General Office & Factories, Hoboken, N. J.

CHICAGO ST. LOUIS

SAN FRANCISCO MONTREAL

(Continued from page 36a)

Cincinnati Industrial-Arts Department Frames Pictures. The industrial-arts department of Cincinnati, Ohio, recently completed the framing of 1,500 copies of the picture, "Old Ironsides," for use in the several schools of the city. It was a large piece of work and comprised the framing of 250 pictures in each of the following schools which undertook the work: Withrow High School, Woodward High School, Hughes High School, Bloom Junior High School, Rothenberg Junior High School, and Stowe Junior High School.

In the framing of the 1,500 pictures, the following materials were used:

2½ miles of oak molding.
2½ miles of gummed paper tape.
2 miles of picture wire.
½ mile of glass, 17 in. wide.
24,000 brads, ¾ in.
3,000 screw eyes.
12 gal. green stain.
12 gal. shellac.

The frames were substantially made and represent a fine piece of workmanship. They will serve not only for displaying the picture of "Old Ironsides," but, from time to time, may be used to inclose other pictures which the principals and teachers may desire to display in the classrooms.

Rehabilitation Work in Need of Financial Aid. The Federal Board for Vocational Education, in a recent communication, points out that the problem of rehabilitating injured citizens is handicapped through a lack of adequate funds for the support of the work. Even in the more progressive states it is found that the program has not yet reached the point of providing a service for all classes of disabled.

The Federal board points to the many advantages which have accrued to the movement, through states cooperating with one another through the medium of Federal promotion. It is believed that in a very short time those states which have not engaged in the work will join the others. Accomplishments i surrounding states should cause a pressure of public opinion which will be impossible to resist.

Most of the states have developed their rehabilitation departments without knowing the total number of persons who annually become eligible for service in their jurisdictions. In two or three states, censuses have been taken, but the data secured were not satisfactory.

Although there is a decided variation in the states in conditions of employment, character of industries, training facilities, and placement opportunities, the rehabilitation program is being administered with a large degree of uniformity and with adherence to the general standards of operation. As a result, the rehabilitation program provided by the various states, is fundamentally uniform in character, scope, types of persons served, and in methods. Thus, higher standards of accomplishment have been made possible than would have been reached had the states worked independently.

It is true that the service will have to be made more extensive in the future, but a good beginning has been made. The extent of the service rendered to individuals has, for the most part, been adequate to restore them to their former economic status.

New York Printing-Trades School Will Extend Work. The New York City board of education has rented an additional floor in the building occupied by the printing-trades school, which has made possible an extension of the facilities provided. It is planned to install additional equipment and to extend the instruction in order that additional students may be accommodated.

A Home and Repair Club at Baltimore, Md. In many of the schools of Baltimore, Md., after-school home and school repair clubs have been formed by the teachers. Pupils are encouraged to do home repairs and to bring to the shop any articles which they can repair themselves. These include furniture, electric irons, waffle irons, electric lamps, and radios. Pupils of the industrial-arts department also make minor repairs about the school buildings where the work is within the range of their skill. These repairs consist of mending locks, hinges, teachers' and pupils' desks, and window lights. An afternoon home-mechanics class for women is conducted each Monday afternoon at one of the junior high schools from three to five o'clock.

Home-Building Project at Akron. The first boy-built home in Akron, Ohio, has been completed by the boys of the building trades classes of the vocational department. The plan was first started in May, 1927, under the auspices of the local board of education and the builders' exchange.

In the work, eight boys were assigned to the carpentry, two to the plumbing, two to electrical work, two to painting, and two to the sheet-metal work. The plastering and bricklaying were done by union apprentices who are indentured to local carpenters and who attend the evening vocational classes of the board of education.

(Continued on page 41a)

(Continued from page 38a)

The home is two stories in height, contains six rooms and a bath, and is complete to the last detail. It is well provided with all conveniences such as radio panel connection, china closet, linen drawers, built-in ironing board, clothes chute, built-in bookcases, and fireplace. The breakfast alcove is large enough to serve for a breakfast or luncheon, as a children's playroom, a sewing room, or for a large dinner. The attic is suited to a variety of uses and may be used as a sleeping room, a playroom, or a billiard room. The house is not extravagant in appearance or construction but is well arranged, substantially built, and pleasing in appearance. It has demonstrated two things, namely, how well a small home can be built, and what kind of work boys can do. The plumbing, heating, wiring, sheet-metal work, and carpentry were done by day students of 12 to 18 years of age representing grades 8, 9, 10, 11, and 12.

The entire work was in charge of Mr. E. C. Auten, assisted by the vocational-training committee, the modern-home committee, and the local builders' exchange.

New Trade Building Erected at Woodlawn, Pa. The first unit of a building to be used for trade-training purposes was completed and occupied in September at Woodlawn, Pa. The building which is of the factory type of construction is located near the high school and houses a machine shop, an electrical shop, a drawing room, and two classrooms. Courses in trade drafting, machine-shop practice, and electrical construction are offered this year and plans are being made to add a course in carpentry and construction. A total of 91 boys enrolled for the first semester and it is expected there will be an increase of at least 35 at the opening of the second semester.

The work is at present organized on the unit-trade basis but will be changed to the cooperative plan as soon as practical. The faculty comprises five men and one woman, and a director. All the teachers have had professional training and can point to a wide experience covering an average of at least ten years.

New Vocational Building at Highland Park, Mich. A new vocational building was opened on November 17 at Highland Park, Mich. The building is located in the rear of the high-school building and provides shops for woodworking, metal working, bookbinding, electricity, printing, automobile mechanics, and mechanical drawing. The building cost $154,000 and the equipment $25,000.

Will Erect Vocational Building at Camp Hill, Ala. Funds have been collected to be used for the erection of a vocational building at Camp Hill, Ala.

Hold 1928 Humane Poster Contest. The American Humane Association of Albany, N. Y., has announced the holding of its 1928 poster contest, which is open to grammar-school students, junior-high-school students, and senior-high-school students, art students, artists, and others.

The contest closes June 1, and is open to five groups of students. Certificates of merit will be awarded in all groups.

The 1927 contest brought in thousands of fine drawings and did much to stimulate better protection and care of children and animals.

Electrical Course for Farmers. The General Electric Company has inaugurated an eight months' course in rural electrification at Schenectady, N. Y., for the benefit of farmers who will install and use electrical devices. The course has been begun in the belief that farmers will better understand electrification when it is expounded by men who know the farming business. For this reason, five men, brought up on farms, have been selected for the training, the first to be begun by a manufacturer of electrical devices. The course will be conducted under the supervision of the sales-training department at Schenectady, and the facilities are those for a veteran educator in electrical instruction.

Manual-Arts Teachers of Ironwood Meet. At the manual-arts meeting held at Ironwood, Mich., Mr. Hans Schmidt of Wisconsin, sounded a warning. A recent survey asking teachers of manual-arts to define their objectives showed a vast difference of opinion as to what these objectives are. He made it plain that any subjects which cannot be justified will eventually be dropped from the curriculum. A subject without well-defined objectives stands in a precarious position.

At the same meeting, Mr. Earl Ferns of the Northern State Teachers' College read a paper on "Home Mechanics as a Basis for the General Shop." He pointed out that the home-economics and general-education aims for manual arts are most important and he urged a gradual development from the woodworking shop to one having facilities for electrical and sheet-metal work. An interesting feature was the presentation of a complete course in structural-steel drawing by Mr. A. W. Holmberg of the Corrigan-McKinley Steel Company. Mr. Holmberg urged that more attention be paid to structural-steel drafting in high-school drawing courses because of the increasing importance of structural steel in construction work.

Raise Qualifications for Iowa Industrial- and Manual-Arts Teachers. Beginning September 1, 1928, the Iowa Department of

(Continued on page 42a)

Hyatt Bearing in Fly-wheel

Two Sizes 30½ and 34½ In.

DIAMOND Power Cutters

are Rapid, Powerful, Durable, Accurate, Convenient, Safe and Most Attractive

Diamond Cutters are also made as Lever Cutters to which Power Fixtures can be easily attached

Send for full information regarding Diamond Cutters and for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Advance Lever Paper Cutters
Lee Two-Revolution Cylinder Press
Hoerner Combination Type-High Machine
Challenge Addressing Machine
Mercantile Addressing Machine
Sieber Adjustable Hand Punch
Challenge Proof Presses
McGreal Combination Printers' Chases
Challenge Labor-Saving Iron Furniture
Challenge Mammoth Iron Furniture
Challenge Notched Iron Furniture
Challenge Semi-Steel Imposing Surfaces
Challenge Pressed Steel Galleys
Challenge Rigid Rim Galleys
Challenge Iron Sectional Blocks and Hooks
Challenge Type-High Gauges
Challenge Quoins and Keys

The Challenge Machinery Co.

GRAND HAVEN, MICHIGAN

Chicago, 17-19 E. Austin Ave. New York, 200 Hudson St.

Six Students-
Six Drawers

Every student enjoys having his private drawer for his own belongings—here it is, in this very popular No. 225 Kewaunee Mechanical Drawing Table. Each drawer with individual key; also master-key. Compartment is shown on left side where drawing boards are stored.

This desk is used in many high schools, where it has won a well-deserved popularity. It is a good seller and it always satisfies.

We are manufacturers of a very complete line of Art and Mechanical Drawing Tables. Write for our complete Book of Illustrations.

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS

Designers and Manufacturers of Art and Mechanical Drawing Room Furniture for Schools and Colleges.

Kewaunee-Economy Plant No. 2
Adrian, Mich.

Instructor's Table No. 300
One of the very best and most satisfactory. Large working surface on top and adequate storage space below.

Kewaunee

(Continued from page 41a)

Public Instruction will require a minimum of twelve semester hours, or eighteen quarter hours, of credit in manual training in an approved college, to qualify as a teacher of that subject in the Iowa schools. The new requirement has been approved since it is an attempt to set a higher standard for teaching of the practical arts and indicates the interest taken by the state department in manual training as a factor in modern education. The requirements are none too high, and it is predicted that they will go even higher as time passes.

Boys' Work in the Metropolis. An interesting development in the welfare council of New York City, is the formation of a boys'-work section in which thirty organizations of New York City's half million boys are cooperating.

Study of Industrial Education. The school board of Boston, Massachusetts, has begun a study of industrial education in the schools with a view of cooperating with industry in learning its needs and its demands in the supply of workmen. As the first step in its study, the board has asked the superintendent to submit detailed answers to the following questions:

1. How many pupils, trained in industrial classes, are being absorbed in the trades for which they were trained?
2. Are the courses of study meeting the requirements of the varied trade standards, both from the employers' standpoint and from the journeymen's viewpoints?
3. Are the costs mounting to a point where the cost of training the individual pupil in industrial education is burdensome?
4. Are there, or should there be, consulting boards in each trade, comprising both employers and employees, who can aid in the formation of courses of study and who also can aid in the solution of the question of supply and demand in the various trades?

Printing on a Productive Basis. Mr. Ralph W. Polk, of Detroit, Mich., holds that one of the chief dangers in printing for production is that the instructor becomes too anxious about "paying his way" and neglects the real job for which he has been employed, namely, the instruction of the pupils. Printing is a highly technical trade and demands that a preliminary knowledge of mechanical details and appliances be learned by the student before he is capable of producing a job of merit.

Mr. Polk pointed out that the responsibility for securing the proper balance between instruction and production in the printshop rests with the printing instructor. If the instructor is not worth his hire as a trainer of youth, he should not seek to justify his presence among his students. If a reasonable amount of productive work can be done without detriment to the real job, so much the better.

The instructor should see that the school arranges the bulk of its printed matter by the year, and not by the week, and in this way the maximum of production may be accomplished with the minimum of interference with the systematic program of the students. School officials will welcome the practical suggestions of a printing instructor who knows his business, and will heartily cooperate in any program which he may outline.

U. T. A. Observes "Father-and-Son Week." The United Typothetae of America, Chicago, Ill., has designated the week of February 20 as "father-and-son week" for printers, with Washington's birthday, February 22nd, as the rallying day.

The observance of the week by the printers has three main purposes in view as follows:

1. Attention is called to the industry as one worthy of being passed down from father to son.
2. An attempt is made to secure a revival of the old-time master and apprentice relationship, that is, the friendly contact between employer and employee, which is lacking in modern industry.
3. It is the purpose of the observance to give greater impetus to the cause of education in and for the industry.

Building-Trades Unions Urge Day Classes for Workers. Representatives of the building-trades unions of New York City recently held a conference with President George J. Ryan of the board of education to urge the establishment of day classes for apprentices in the continuation schools, as an extension of the classes now conducted in the evening schools. Similar classes are being conducted for apprentices in the printing-trades day continuation school.

The apprenticeship classes in the evening schools have begun their fifth year and are training 6,000 indentured apprentices in eight trades. The classes are conducted with the cooperation of the employers and trades union, and the work is supervised by committees of the trades.

New Vocational Building Completed at Highland Park. The vocational building recently completed at Highland Park, Michigan, is located on the high-school grounds and houses the music department and the shop classes of the junior high school, senior high school, and junior college. The printing department which is also housed in this building, offers in addition to printing, a course in bookbinding. Books which have become dilapidated in use are rebound and brought to their former condition by pupils of the bookbinding classes.